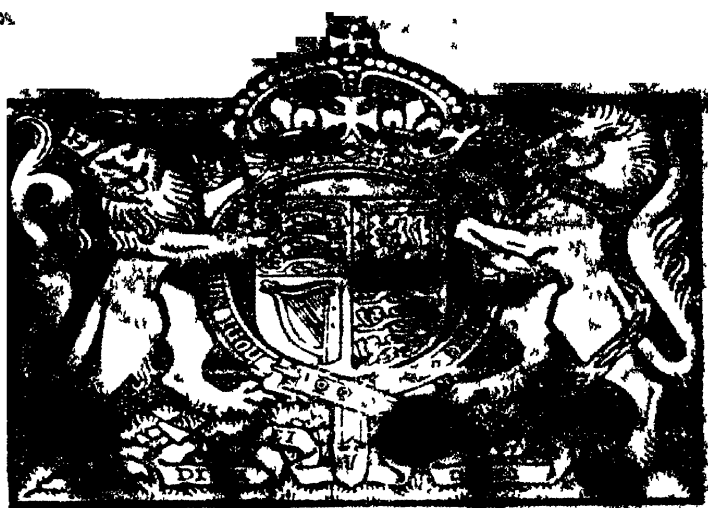


I. A. R. I.—6



**IMPERIAL AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI**

REPLACEMENT—5,000—25 5-48 GIPs

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 1 April, 1934

NOTES FOR THE MONTH

Retail Prices of Milk: Report of Consumers' Committee

In the last contract period, the sale of milk by retail was governed by a condition inserted both in the wholesale contract and in the producer-retailer's licence that milk must not be sold at a price below the prevailing retail price in the district. Neither prices nor districts were specified, but were left to be settled locally by retailers and producer-retailers. In these circumstances there was undoubtedly a tendency in some cases for retail prices to be fixed higher than they needed to be; in certain rural districts, for example, they were brought to the same level as that ruling in London.

The question of retail prices came under the early notice of the Consumers' Committee for England, which, after a careful examination of this subject, submitted a report to the Minister. In this report, exception was taken to the method of determining retail prices with reference to the "prevailing price in the district." The Committee suggested that a more satisfactory method would be that of prescribing minimum margins between wholesale and retail prices, which might vary in different parts of the country and towns of different size. The Milk Marketing Board, to whom the Committee's recommendations were communicated, expressed agreement with the proposals. A new arrangement has, in fact, been embodied in the wholesale contracts for the period April to September, 1934. The term "prevailing price" has been deleted and replaced by "minimum appropriate price." The minimum appropriate price represents the wholesale purchase price, per gallon, of milk, plus a minimum margin which varies in amount according to the district in which the milk is retailed. Five types of districts and the corresponding

NOTES FOR THE MONTH

margins for each are set out in the contract as

	District	Minimum margin
	An area administered by a Rural District Council or an area of less than 10,000 inhabitants administered by a Municipal Borough Council or Urban District Council	8d per gal
	(2) An area administered by a Borough or County Borough Council with a population exceeding 10,000 but not exceeding 50,000 inhabitants	9d per gal
	(3) An area administered by a Borough or County Borough Council with a population exceeding 50 000 inhabitants	10d per gal
	(4) An area administered by a Rural District Council or an area of less than 10,000 inhabitants administered by a Municipal Borough Council or Urban District Council	8d per gal
South-Eastern	(5) An area administered by a Municipal or County Borough Council with a population exceeding 10,000 inhabitants, including the area of the City of London and the Metropolitan Police District	10d per gal

The new arrangement will still allow retailers and producer-retailers to sell milk at any price that is not less than the minimum, but since it provides for an element of competition it should prove an effective safeguard for the consumer

Licensing of Bulls in England and Wales

THE MINISTER of Agriculture and Fisheries has made Regulations that will govern the procedure under the Improvement of Live Stock (Licensing of Bulls) Act, 1931, when the Act comes into force in England and Wales on August 1, 1934.

The Act provides that no bull that attains the prescribed age on or after the appointed day shall be kept without a licence or permit. The age prescribed in the Regulations is 10 months, so that a bull that attains the age of 10 months on or after August 1, 1934, may not be kept after it reaches that age, unless a licence or permit has been obtained for it. Every bull born on or after October 1, 1933, will thus come

NOTES FOR THE MONTH

under the terms of the Act, but the Act will not apply to bulls born before October 1, 1933, as these bulls will be over 10 months old on August 1, 1934.

The Regulations provide that the application for a licence shall be made not later than 28 days before the bull concerned attains the prescribed age, i.e., an application for a licence will have to be made when a bull reaches the age of 9 months. An application for a licence must be made on the prescribed form and a fee of 5s. will be payable in respect of each bull. Forms of application will be obtainable, on and after July 1, 1934, from the Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, or 17, Eastgate, Aberystwyth.

Every bull in respect of which an application for a licence is made will be inspected by an Officer of the Ministry. Inspection will normally take place on the premises of the bull owner, and under the Regulations bull owners will be required to provide all reasonable facilities and assistance for the purpose of the inspection and marking of their bulls. A bull that is passed for licence will be tattooed in the right ear with a crown and identifying letters and numbers, and a bull that is rejected for licence will be tattooed in the left ear with the letter " R."

A licence will not be granted in respect of a bull that appears to be:—

- (a) of defective or inferior conformation and likely to beget defective or inferior progeny; or
- (b) permanently affected with any contagious or infectious disease; or
- (c) permanently affected with any other disease rendering the bull unsuitable for breeding purposes.

If a bull appears to be temporarily affected by a disease or defect rendering it unsuitable for breeding purposes a notice of suspension will be issued with the licence prohibiting the use of _____ purposes for a specified period. In _____ powers given to him in the Act, the _____ the slaughter or castration of any bul _____ s refused, unless a permit is granted t _____ mited period for fattening purposes.



The owner of a bull in respect of which a licence is refused or suspended may, however, appeal against the Ministry's decision within 14 days from the date of the refusal or notice of suspension. When an appeal is lodged the bull will be inspected by one or more members of a panel of referees. The panel of referees will be constituted by the

NOTES FOR THE MONTH

Minister, as provided by the Act, on the recommendation of such agricultural associations and cattle-breeding societies as the Minister may consider it expedient to consult. The fee payable in respect of an appeal against the refusal or suspension of a licence will be 2 guineas, and this fee will be returned to the bull owner if the appeal is successful.

Bull owners will not need to make their first applications for licences until the beginning of July next, and before that time the Ministry proposes to issue, for the guidance of bull owners, a booklet in which the procedure regarding the licensing of bulls will be set out in detail. The Ministry will make a further announcement when this publication is available for circulation.

The Regulations, which are issued as Statutory Rules and Orders, 1934, No. 239, may be obtained, price 3*d.*, from His Majesty's Stationery Office at the following addresses:—Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh 2; York Street, Manchester 1; and 1 St. Andrew's Crescent, Cardiff.

Potato-Growing Conference

A CONFERENCE on problems of potato-growing was held at the Rothamsted Experimental Station on February 20. Captain J. Mollett, Chairman of the Potato Marketing Board, presided, and papers were read by Dr. G. H. Pethybridge ("Potato Diseases"), Dr. R. T. Leiper and Dr. M. J. Triffitt ("The Eelworm Problem"), Dr. H. E. Woodman ("Utilization of Excess Potatoes on the Farm"), and Dr. E. M. Crowther and Mr. H. V. Garner ("Results of Recent Fertilizer Experiments").

Captain Mollett said that it would be one of the duties of the Potato Marketing Board to prevent diseased tubers from reaching the market, and if disease could be controlled on the farm, it would be all to the good. There would be need for equity in dealing with a farmer who had a crop damaged by eelworm, and he should not be penalized. The farm was a factory, and, if it could be shown how "excess" potatoes could be used thereon, it would be better than erecting factories to absorb them. The use and misuse of fertilizers needed very close consideration. It would be the duty of the Potato Marketing Board to ensure that the public would be served with better-grade potatoes. The task would take time, and only as a result of trial,

NOTES FOR THE MONTH

research, scrapping of bad methods, and the introduction of new ideas that were worth while, would it be possible to build up a system of sound production and marketing.

Dr. G. H. Pethybridge gave a very lucid exposition of the numerous diseases to which potatoes are subject, and emphasized some of the difficulties of prevention: even the knife used to cut "seed" might carry disease to clean tubers. Potato blight was still by far the most important and injurious of all the potato diseases in this country. [It is hoped to publish Dr. Pethybridge's paper in the May issue of this JOURNAL.]

Dr. Leiper said that the eelworm (*Heterodera schachtii*) was first diagnosed on potatoes in this country in 1917, and it was already recognized as a very serious and widespread pest. Its prevalence on sugar-beet in Germany was due to repeated growing of the crop on the same land, and to neglect of rotations. Strains of the eelworm occurred that differed only slightly from one another, but the differences were of importance in practical cultivation. Where highly-fertile and valuable land was infested, it might be economic to carry out certain treatment; elsewhere, it would not be economic and wide rotations were necessary. Three main lines of investigation that deserved to be followed up were: (1) elimination of the pest from infested land; (2) variation in farm practice; and (3) reasons for the spread of the pest. It was desirable to bear in mind the fact that the eelworm might be distributed in bags of seed tubers, and so brought to clean land. It would be well to create a demand for seed tubers guaranteed clean and free from this pest.

Dr. Woodman observed that almost the sole function of potatoes in the ration was to furnish carbohydrates: hence they must be used with foods rich in albuminoids. Potatoes had rather more than twice the food value of swedes, and the farmer would not be far wrong if he reckoned 1 lb. of potatoes as equal to 2 lb. of swedes, although, strictly speaking, the ratio was nearer 1 to 2½. Comparing potatoes with cereals, Dr. Woodman said that the main distinction lay in moisture content, the dry food material in potatoes closely resembling that of cereals; potatoes were watered carbohydrate foodstuff, and 1 lb. of cereal meal was, approximately, equivalent to 4 lb. of potatoes. Greater use of potatoes on the farm would enable us to cut down considerably our huge imports of maize. After directing attention to various precautions that should be taken in utilizing

NOTES FOR THE MONTH

potatoes for stock, Dr. Woodman dealt with the inclusion of potatoes in rations for fattening cattle, dairy cows, horses, sheep and pigs; and made brief references to preservation of tubers by ensilage, and to the use of potatoes for the manufacture of power alcohol.

Dr. E. M. Crowther and Mr. H. V. Garner, in their papers, dealt with trials indicating the response of potatoes—both as regards quality and quantity—to applications of fertilizers of different classes.

Dr. R. N. Salaman gave some interesting information with regard to the work that was being done on blight-resistant varieties and also on virus-free stocks. He drew attention to the fact that some of the seedlings he had under observation showed indications of some promising results, but considered that it was too early to state whether they would be of commercial value.

After the excellent papers had been read, there was a spirited discussion, in which a number of farmers and scientific workers took part, and Sir John Russell, in reviewing the various contributions, directed attention to points of special importance.

A New Zealand Prize-Winning Wheat

LORD BLEDISLOE is finding in New Zealand fresh opportunities for exercising that keen interest in agriculture and agricultural research for which he is so widely known and esteemed in this country. Amid his duties as Governor-General of the Dominion, he has found time to give practical attention to some of its agricultural problems, among them wheat growing. The New Zealand wheat farmers have been growing very soft wheats, and, with high labour costs, have found it difficult to make a profit on the prices paid by the millers. His Excellency, therefore, offered prizes last year for the best samples of hard, glutinous, thin-skinned wheats, of the type of Marquis, Garnet or Yeoman, grown in the Province of Canterbury. The area grown was not to be less than 2 acres, and the product was to be judged from the standpoint of millers' and bakers' requirements. Separate prizes were also offered for the best loaves baked from wheat grown in this Province.

The result of the wheat-growing competition was announced at the Canterbury Agricultural and Pastoral Show, held at Christchurch in November last. The first

NOTES FOR THE MONTH

prize was awarded to Mr. H. Kendall for a sample of Jumbuck, and the second, for a sample of Garnet, to Mr. P. V. Bailey. The Jumbuck wheat yielded an average of 54 bushels to the acre, which Dr. Hilgendorf, Director of the New Zealand Wheat Research Station, reports as very good for wheat grown under the climatic conditions of the Dominion. Jumbuck also took first place in the baking competition, loaves made from flour of this variety scoring 70 points out of a possible 100.

Samples of the winning wheat, and flour milled therefrom, have since been received in this country by Professor Sir Rowland Biffen. Concerning the flour samples, which have been tested at the Plant Breeding Institute, Cambridge, Sir Rowland states:—"They are somewhat creamy in colour, and lively and granular in texture. Though the quantities were inadequate for a critical baking trial, the tests on the character of the gluten leave no doubt that Jumbuck is capable of producing loaves of far better quality than the average English wheat."

Rothamsted Experimental Station

THE menace of encroaching building development has made it necessary for the Committee of the Rothamsted Experimental Station to launch a public appeal for a fund of £30,000 to purchase their holdings. The Station has a world-wide reputation as the birthplace of agricultural science. Founded in 1843 by John Bennet Lawes, it was worked by him, in association with Joseph Henry Gilbert, until 1900, the longest partnership in the history of science. Before his death, Lawes established a Trust to continue the work, and gave to it, for a term of years, the use of the land on which the field experiments had been carried out. The growth of the work compelled the Trust Committee (the Rothamsted Committee), in 1911, to take the Home Farm on lease, and other land has since been leased from the Lawes Estates. The old leases and agreements no longer afford a prospect of the peaceful continuity essential for agricultural experiments. It has become necessary to purchase, and the Trustees of the Lawes Estate have agreed to sell the necessary land to the Rothamsted Committee for the sum stated.

It is observed that the special feature of Rothamsted is the fact that its field experiments go on continuously year after year, and that very full field records are taken. No

NOTES FOR THE MONTH

other agricultural experiment station has been able to continue its field work so long and so systematically, and hence no other station can boast the wealth of field records that Rothamsted possesses, and to which it is continually adding.

Agricultural experiments are necessarily anchored to the land. Were the builder allowed to gain possession of the Rothamsted field plots—and some of them are already zoned for housing—many years would elapse before such good material could be reassembled. The process would be both costly and wasteful; it would be far more effective to preserve the present fields and maintain the continuity that is so essential for the successful conduct of agricultural experiments.

The appeal is signed by the Duke of Devonshire (Chairman of the Society for the Extension of the Rothamsted Experiments); Sir F. Gowland Hopkins (President of the Royal Society); the Earl of Stradbroke (President of the Royal Agricultural Society); Mr. Stanley O. Ratcliff (President of the National Farmers' Union); Lord Clinton (Chairman of the Lawes Agricultural Trust Committee); Sir A. D. Hall (Scientific Adviser to the Ministry of Agriculture and Fisheries); and Sir E. J. Russell (Director of the Rothamsted Experimental Station). Further information will be given by the last-named, to whom donations should be sent at the Rothamsted Experimental Station, Harpenden, Herts.

Agricultural Scholarships

THE MINISTRY of Agriculture and Fisheries invites applications for the undermentioned scholarships, which are being offered for award this year under the scheme of scholarships for the sons and daughters of agricultural workmen and others. The scholarships cover the whole cost of instruction and maintenance while students are in residence at the institutions concerned.

5 Senior Scholarships, tenable at Agricultural Colleges or University Departments of Agriculture for diploma or degree courses in agricultural subjects, or at Veterinary Colleges for courses in veterinary science.

130 Junior Scholarships (including 10 Extended Junior awards for those who have already held Junior Scholarships), tenable at Farm Institutes or similar institutions for courses not exceeding one year in duration, in agriculture, horticulture, dairying or poultry husbandry.

NOTES FOR THE MONTH

Candidates for such scholarships must intend to take up an agricultural pursuit after receiving the training covered by the award, and must be:—

- (a) sons or daughters of agricultural workmen or of working bailiffs and small-holders whose means are comparable with those of agricultural workmen; or
- (b) *bona fide* workers in agriculture; or
- (c) sons or daughters of rural workers whose means and method of livelihood are comparable with those of agricultural workmen.

Candidates must be able to satisfy the Selection Committee that they are in a position to derive educational benefit from the proposed courses of instruction. Selection is by interview only, no written examination being required.

Full information concerning the scheme, including forms of application, may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, or from County Authorities for Agricultural Education. The latest date for receiving applications is April 30, 1934.

Inspection and Certification of Wild White Clover

FARMERS are reminded that applications for inspection of fields under this scheme must be received by the respective National Farmers' Union County Committees not later than April 15, 1934.

Applications may be made not only in respect of fields that it is hoped to harvest this season, but also in respect of any fields from which seed eligible for certification can be harvested in future seasons. It must be remembered that there will be an interval of at least one season between the date of application and the actual recording of an "approved field," owing to the necessity for a growing-on test of a sample of seed from the field.

The advantage of having registered seed to offer is that it carries an absolutely independent guarantee, which helps both the farmer himself when selling and the merchant who may wish to dispose of the seed in another district.

Only two grades of fields can be accepted for registration:—

- (A) "Old Pastures" that have been down for at least ten years.
- (B) Fields sown with seed obtained from pastures that are at least ten years old.

NOTES FOR THE MONTH

(There is no minimum age limit for fields in the latter class (B); what matters is the age of the pasture from which the seed sown was obtained.)

Since the inauguration of the scheme in 1930, about 8,000 acres have been approved as suitable to produce certified genuine English Wild White Clover seed. There seems no reason why in the course of a few more seasons all requirements of English Wild White Clover seed should not be met by supplies from approved fields.

The cost of inspection—which is the only cost that the farmer has in connexion with the scheme—is 2s. per acre up to ten acres (with a minimum charge of 10s.), and 1s. for each additional acre or part of an acre.

The scheme is open both to members and non-members of the N.F.U. and forms of application can be obtained from the Secretary of the County Branch of the N.F.U.

Investigations on Tuberculous Infection in Milk

THE Medical Research Council recently issued a Report, prepared by the Department of Health for Scotland, on Tuberculous Infection in Milk.* The Report deals with the results of investigations carried out in Edinburgh, Glasgow, Dundee and Aberdeen, and should be read by all who are interested in the production and distribution of milk. The inquiry covered a wide field, and all types of milk were examined at various stages in the handling and distribution of supplies.

One of the numerous interesting points that emerge from the report is the difference in effectiveness between the flash method of pasteurization and the holding system. Of 291 samples of milk pasteurized by the flash method, 24 (or 8.2 per cent.) gave positive results, while of 1,243 samples of milk that had been treated by the holding method only 35 (or 2.8 per cent.) gave positive results.

More than 700 samples of "Certified" and Grade A (T.T.) milk were examined, and only one sample gave a positive result; the infection in this instance was due to the fact that adequate steps had not been taken to protect the herd from direct contact with neighbouring infected stock.

* *Tuberculous Infection in Milk*. A Report by the Department of Health for Scotland. Medical Research Council Special Report Series No. 189. H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 9d., post free, 10d.

NOTES FOR THE MONTH

Agricultural Research Scholarships and Studentships for Research in Animal Health

THE Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland invite applications for the following *post-graduate* Agricultural Research Scholarships and Studentships for Research in Animal Health, tenable as from the 1st October, 1934, for a period not exceeding three years:—

- (1) Three Agricultural Research Scholarships, each of the value of £200 per annum, to which will be added, if necessary, a sum not exceeding £50 per annum for fees and expenses.
- (2) Two Studentships for Research in Animal Health, each of an *inclusive* value not exceeding £300 per annum.

Applications must be received not later than June 15, 1934. Nomination forms and further particulars may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, or from the Secretary, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh 2, according to the country in which the candidate resides.

Horsham Young Farmers' Club

A YEAR ago, the Committee of the Horsham Young Farmers' Club decided to give annual subscriptions to this JOURNAL as prizes to those of their members who had done good work during 1932. This interesting innovation in prize-giving, and, incidentally, indication of the Committee's appreciation of the JOURNAL'S value to young farmers, has again been adopted in respect of good work done during the year 1933, for which the Committee have awarded annual subscription prizes to Miss Noreen Lee, and Messrs. Norman Corke, George Lee, Charles Shearing, Cyril Cudlipp and J. C. Nash.

Revision Course in Horticulture at Reading University

It has been arranged to hold a revision course in horticulture at the University of Reading from Tuesday, September 11 to Friday, September 14, 1934 (both dates inclusive), during which week the Horticultural Education Association will, it is understood, be holding its annual meeting at Reading.

The Course is suitable primarily for members of the horticultural staffs of county education authorities, colleges and universities, but growers and other persons interested in the horticultural industry will also be welcome. The papers and discussions will deal with commercial vegetable

NOTES FOR THE MONTH

and flower cultivation. The tuition fee for the course will be £2.

Full accommodation—bed, breakfast, lunch, tea and dinner—at a charge of 11s. per day, can be obtained by members of the conference in the University Halls of Residence, from Monday evening, September 10, to Saturday morning, September 15. Further inquiries concerning the Course should be addressed to the Agricultural Office, University of Reading.

Advisory Leaflets

SINCE the date of the list published in the October, 1933, issue of this JOURNAL (p. 674) the undermentioned Advisory Leaflets have been issued by the Ministry:—

- No. 10. Fruit Tree Red Spiders (Revised).
- No. 71. The Colorado Beetle (Revised).
- No. 186. Wire Fencing for Grass Land.
- No. 187. Woolly Aphis.
- No. 188. The Folding System of Poultry Keeping.
- No. 189. Turnips, Swedes and Kohl-Rabi.
- No. 190. Bracken.
- No. 191. Sturdy or Gid in Sheep.
- No. 192. The Kestrel.
- No. 194. Titmice.
- No. 195. Diamond-Back Moth.
- No. 196. The Turnip Gall Weevil.
- No. 198. Gooseberry Cluster-Cup Rust.
- No. 199. Wireworms.

Copies of any of the above-mentioned leaflets can be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Sale Offices of that Department at Edinburgh, Manchester, Cardiff and Belfast, price 1d. each net (1½d. post free), or 9d. net per doz. (10d. post free).

Single copies of not more than 20 leaflets will, however, be supplied, free of charge, only on application to the Ministry. Further copies beyond this limit must be purchased from H.M. Stationery Office, as above.

A selected list of the Ministry's publications, including leaflets, on agriculture and horticulture can be obtained free and post free on application to the Ministry.

The Imperial Fruit Show, 1934

It has been arranged to hold the 14th Annual Imperial Fruit Show and Cannery Exhibition at the Granby Halls, Leicester, from November 2 to November 10, 1934. The National Food Canning Council is again co-operating with the Imperial Fruit Show Committee, and will organize a section for cannery, canning machinery and allied industries.

SOME IMPRESSIONS OF BRITISH FARMING

III—THE EAST AND SOUTH-EAST

J. A. SCOTT WATSON, M.A.,

*Sibthorpian Professor of Rural Economy, University
of Oxford.*

Norfolk.—Ever since the days of " Turnip " Townsend, two hundred years ago, Norfolk has deserved the name of England's premier arable county. It was here that the Agricultural Revolution had its beginnings, and here too that it was most completely carried through. Defoe, writing just before Townsend's time, describes Norfolk as so thickly set with towns and large villages that he judged it to be, next to the London area, the most densely populated district in England. Apart from farming, silk and wool were then the industries by which the people lived, and Defoe was told that, in those days, the output of 120,000 workers passed through Norwich cloth market. The word *worsted*, derived from the name of the Norfolk village of Worstead, is a reminder of the country's former eminence in manufactures.

With the change-over of the textile industries to the factory system, and with the consequent need for water power, there was a wholesale migration of workpeople to the north of England. The old mixed economy, which had largely provided its own market for farm produce, disappeared, and Norfolk turned to the wholesale production of food for the urban population, chiefly of London. The farms became, for the most part, factories for the production of corn and meat.

The changes that were made to this end have been often described—the introduction of clover, turnips and later of mangolds; the devising of the four-course rotation; the concentration upon the winter fattening of cattle and sheep, the former being brought, as stores, from as far away as Galloway and Caithness; and finally, as in many other arable districts, the steady tendency towards the amalgamation of the old small farms into larger units. Norfolk remains to-day a county of corn and bullocks and big farms. Actually it has a greater number of holdings in the largest class (300 acres and over) than any other administrative county in England. In spite of the opening up of

IMPRESSIONS OF BRITISH FARMING—III

the American prairies during last century, and the flood of imported grain, fully one acre in every three of Norfolk's farm land still carries its crop of corn—a proportion that is equalled only by the neighbouring counties of Cambridge and West Suffolk. In Norfolk the effect of prairie wheat was not to cause a grassing-down policy. A certain amount of land, however, principally the very poor sandy "breck" round Thetford, went out of cultivation altogether, reverting to heath or rabbit-warren or being planted with pines. Although wheat growing had heavily declined until the time of the Wheat Act, the vast acreage of barley has been steadily maintained, and the area under oats has increased. Barley is, of course, easily the main corn crop, occupying well over half the total cereal area, and, as is well known, reaches a standard of quality that no other area of comparable size, anywhere in the world, can approach. The only considerable change in the barley business, during the past generation, has been the replacement of the old Chevalier type with new sorts, chiefly Spratt-Archer. The object of this change has been, not to improve the quality (for that would seem scarcely possible), but rather to make possible a more generous manurial policy and thus to secure heavier yields.

The total area of root and fallow crops has not sensibly declined during the past forty years, but the relative importance of the different species has changed very greatly. The following is a comparison of the respective acreages in 1893 and 1932:—

					<i>Thousands of Acres.</i>	
					1893.	1932.
Potatoes	..	..	..	..	5.7	20.7
Turnips and Swedes	..	..	..	..	131.2	47.2
Mangold	..	..	..	..	47.1	37.2
Sugar-Beet	..	..	..	..	—	66.0*
Cabbage, Kale, etc.	..	..	..	..	3.9	4.7
					187.9	175.8

The increase in potatoes has occurred mainly in the corner of fen-land, near King's Lynn, that is included in Norfolk. Elsewhere the crop has made little progress. On the other hand, sugar-beet is everywhere in evidence, on sand, loam and fen, and the crop has been of inestimable value to the harassed farmer in recent years. Indeed, it is difficult to see how Norfolk could have come through the crisis without the beet subsidy.

* This figure further increased to 99,000 acres in 1933.

IMPRESSIONS OF BRITISH FARMING—III

Bullock-feeding methods are changing with the times. The Norfolk Agricultural Station has devoted a great deal of labour to the problem of adapting methods to the new conditions. Thus it has shown how to make the best use of sugar-beet by-products—tops, dried pulp, and wet pulp, both fresh and ensiled. Again, it has guided the tendency to carry out the whole fattening process upon somewhat less intensive and certainly less wasteful lines. In the old days a full hundredweight of roots and nearly a stone of cake formed the foundation of the ration, whereas now the total food value is kept at a lower level, fewer roots are included and more use is made of home-grown foods and of the cheaper imported foodstuffs like maize products and rice meal. The Station has also shown that other cakes, such as ground-nut and palm kernel, may be successfully substituted for the traditional linseed and cotton.

Even with all these economies, and with store beasts that seemed cheap to buy, bullock-feeding has, in recent years, produced almost consistent and often very heavy losses. Of course it has been often said, ever since the beginnings of the Argentine chilled beef trade, that winter-fed bullocks have never paid for their keep. Incidentally the same thing has been said about the breeding flock of sheep, maintained on arable crops, ever since the arrival of New Zealand lamb. In either case there is rarely any question of direct profit, but merely the conundrum whether the indirect gain, in the shape of soil fertility, is a sufficient compensation for the immediate financial loss on the animal itself. There is of course no doubt that under the old conditions, when the four-course rotation was first worked out, corn and stock were inseparable. The question is whether to-day the position is so much altered, by the cheapness and abundance of artificial manures, as to make corn growing without stock a permanent possibility. Perhaps the best-known experiment in the new way—that of Messrs. Alley at South Creak, near Fakenham—is being carried out in Norfolk, but the general attitude of the Norfolk farmer is one of "wait and see."

Meanwhile the general tendency is not to abandon live stock, or even to reduce numbers, but to endeavour to substitute a profitable for an unprofitable servant. Thus dairying has increased to a surprising extent, despite the obvious difficulty of growing grass in a dry climate, and the county's pig herds have more than doubled in the past

IMPRESSIONS OF BRITISH FARMING—III

generation. The large farmer, in Norfolk or anywhere else, does not take kindly to the cow, the pig and the hen as substitutes for yardfuls of big bullocks and great folds of ewes. There is, however, no room for sentiment or prejudice in modern farming policy.

The Fens.—It is a rather noteworthy fact that recent agricultural changes in the fen district have been in many instances the precise opposite of those that have characterized the country generally. Farmers as a body have been laying away land to grass, adopting rather less intensive methods of cropping and reducing the number of men employed. The fen farmer, on the other hand, has been ploughing out old grass, has been turning to ever more intensive cropping and has, necessarily, been increasing his labour staff. In many other counties the most noteworthy of recent agricultural developments has been the increase of dairying, whereas cow keeping, never an important department in the fens, has here declined.

The fact is that fen farming is departing more and more from the old traditional mixed system, and from the ordinary types of crops and stock, and is concentrating more and more on those products for which its peculiar types of soil make it specially suited. Thus a comparison of pre-war fen-land with the district to-day shows an immense increase (nearly 40 per cent.) in the potato acreage, and the crop now occupies practically 25 per cent. of the farm land. Moreover, the more intensive manuring that has become usual has probably increased the output per acre to a very considerable extent. Sugar-beet has been introduced upon a considerable scale, but less at the expense of the other root crops (which long ago declined to a position of very minor importance) than at that of barley and oats. The wheat area has been well maintained, while small fruit, orchards, and vegetables like celery and picking peas have all increased greatly in importance. The flourishing bulb industry near Spalding is another important addition to the list of specialities. Apart from its old function of supplying London and the Industrial North with potatoes and fresh vegetables there has been a very notable increase in the canning industry of the fen-land, and with the new methods of canning and the greatly increased care now taken in the selection of suitable material, the quality of the products has reached a very high level.

IMPRESSIONS OF BRITISH FARMING—III

It might perhaps have been expected that scientific progress in connexion with soils and manures would have tended to diminish the difference in value between good and poor land. It might have been thought that the effect of this progress would be to raise the fertility of the poorer land and leave the naturally rich land much as it has always been. Meanwhile, however, the demand for what are really garden crops has greatly increased, while that for grain has diminished. The garden type of land—deep and moist, yet easily workable soil situated in a sunny climate—has therefore actually increased in value as compared with ordinary useful arable. Of course, not even the fen district, which is incomparably the richest large block of land in England, is a hundred per cent. good. There are patches of poor clay and occasional pieces of land that present special problems: but both the silt and the black fen, which are the prevalent types, are worth relatively more to the farmer to-day than they have ever been.

Fen-land farming is of course a business of many risks, for it deals very largely in perishable products. It offers few attractions to people who want to farm for pleasure, for it demands unremitting attention to business and provides few opportunities for rural sports. Moreover, it would seem to be a business to which men must be specially bred, for here you will find scarcely any of those Scottish or Welsh or Devon or Cornish immigrants who are so much in evidence in most parts of South-East England. This, indeed, is scarcely surprising, for a plain arable farmer, accustomed to ordinary stock and crops, must feel rather at sea about the whole business.

The Lea Valley.—The tremendous development that has occurred in the glass-house industry during the past two or three years is a matter of common knowledge. The cause of this special spurt is of course the considerable measure of protection that has been given to the home grower, but there is no doubt that the industry would have expanded in any case, for, with a rising standard of living, there must come a growing market for commodities that used to be consumed only by the wealthy few. The first great development of the business occurred in the Lea Valley, north of London, and it is here that by far the greatest concentration of glass is to be found. The importance of the industry is quite recent, dating really from the time when

IMPRESSIONS OF BRITISH FARMING—III

the tomato came into popular demand. Some men who might almost be described as pioneers are still alive—a good many of them, incidentally, being Dutchmen or Danes.

The glass-house industry demands an intensity in the application of capital, labour and science such as is encountered nowhere else. The cost of establishment usually exceeds £2,000 per acre, and may often reach £3,000. It is higher still in the few instances in which grapes or peaches are grown in preference to the ordinary annual crops, like tomatoes and cucumbers. The value of the output under glass is of course correspondingly large, a good yield of tomatoes being of the order of 40 tons per acre.

Perhaps the greatest technical difficulty that the industry has had to face is in connexion with the "sickness" of green-house soils, which seems to develop inevitably in the absence of special precautions. When the difficulty first arose it had to be met by the complete replacement of the soil, or alternatively by moving the glass on to fresh ground. Then came the Rothamsted work on soil sterilization, and the use of steam heat for the purpose of refreshing the soil is now a part of the standard practice. It is possible that some cheaper method still remains to be discovered.

It is amusing to speculate how much farther it will be possible to go along the lines of intensifying production from the land. So far, in the ordinary glass-house, about four of the important conditions for plant growth may be kept practically at the optimum—the moisture supply of the plant, the air temperature, the air humidity and the supply of chemical plant food in the soil. Among the other possibilities is that of controlling the soil temperature, and in some of the modern houses soil-heating installations are already being included. There is also the very important factor of light, and both in Holland and at the Cheshunt Research Station, in the Lea Valley, active experimental work in the use of artificial light is in progress, though there seems to be a good deal to do before the idea can be exploited commercially. The only important possibility that remains to be explored is that of artificially augmenting the supply of carbon dioxide in the air. That there will always remain a mass of incidental problems, like those of disease and insect control, storage, marketing and so forth, goes without saying.

Kent Fruit Growing.—Despite the general similarity in

IMPRESSIONS OF BRITISH FARMING—III

climate, it would be difficult to find in England a more complete contrast than that between Norfolk and Kent. In the former the typical scene is one of mile upon mile of plain arable farming, for the most part rather specially well done. Kent is a county of contrasts. There are two large stretches of poor chalk downland. There are belts of the most stubborn clay. There are the remarkable pastures of Romney Marsh. There are stretches of rich silt, and of deep, mellow greensand soil. Inevitably there is an immense variety in the farming—grass and arable, sheep and dairy cows, corn, early potatoes, vegetables, small fruit, orchards and hops.

Among all these features perhaps the outstanding one is fruit culture. This is a very old industry, and the growers and workers have the benefit of a great store of traditional knowledge and skill. Yet there is probably no branch of agriculture to which science has brought greater changes during the past twenty years. Of course science is not by any means being universally applied; indeed, there seems to be no branch of farming in which efficiency varies so much as in fruit production. It is still possible, in many parts of the country, to find orchards in a state of almost complete neglect and consequently leaving no adequate return for the land they occupy. Most of these certainly occur on mixed farms, and perhaps illustrate more than anything else the truth that it is possible to have too many side lines. More and more it is being realized that success in fruit growing requires a high degree of technical skill, unremitting attention, a large investment of capital, and liberal expenditure on labour, spraying materials and manures.

A mere catalogue of the chief steps of progress in the science of fruit growing would occupy many pages, but some of the outstanding developments may be briefly mentioned. For one thing the system of pest control has been vastly improved, so that the proportion of damaged or blemished fruit—almost unmarketable under the conditions of modern competition—has been vastly reduced. Research has shown that manuring—more especially the nitrogen-potash balance—is important, not only in relation to yield but in connexion with quality characteristics such as colour, flavour and ability to keep. Moreover, it has been shown that different types of fruit, such as dessert and culinary apples, require very different treatment if the best results

IMPRESSIONS OF BRITISH FARMING—III

are to be secured. Indeed, in some instances the problem of producing high-grade dessert apples is one of reducing rather than of increasing the nitrogen reserves of the soil.

A survey of the reserves of fruit land in England, only partially completed, has shown that there are considerable areas, entirely suited to certain types of fruit, still available, whereas there are many orchards established on land that is inherently ill adapted to fruit of the sort planted.

The work of the East Malling Research Station on root-stocks for tree fruits is now well known, and is being very actively exploited by commercial growers. It would seem that the station is likely to achieve equally valuable results with stocks of small fruit. The whole problem of "degeneration" or "running out" of raspberries, strawberries, etc., seems to be one of virus disease, and if the Station should succeed in working out a technique for the maintenance of virus-free stocks, the possibilities of increased yields of these crops will be enormous.

Extraordinary progress is also being made in the matter of fruit storage. Even with highly perishable fruit like cherries, low temperature storage is having the effect of extending the consuming season for two or three weeks, and is thus diminishing the risk from temporary gluts, and opening up the possibility of increasing production. The latest innovation is gas storage, whereby both the temperature of the store and the carbon dioxide content of the air can be kept under control. It is this invention that is making possible the trade in chilled meat from New Zealand, which is just beginning. The application will probably react to the disadvantage of the British meat producer—but it is also making possible the presentation of English apples, in perfect condition, right up to the beginning of summer. By the majority of consumers, who still believe that the English Cox is incomparably the finest thing in dessert apples, and the English Bramley the best of all "cookers," the invention will be hailed with unmixed pleasure.

EXPERIMENTS ON THE VALUE OF DECORTICATED SUGAR-BEET SEED*

F. HANLEY, M.A.,

School of Agriculture, Cambridge.

IN the cultivation of the sugar-beet crop, great importance is attached to the establishment of a full and uniform "plant." The germination of sugar-beet seed, under field conditions, is often slow and irregular; and, in a season when weather conditions are unfavourable, seedlings may continue to appear long after singling has been completed. There is little doubt that one of the principal causes of this phenomenon is the nature of the sugar-beet "seed" itself. A so-called sugar-beet "seed" is, like that of the mangold, not a true seed in the botanical sense but an aggregation or cluster of single-seeded fruits to which certain parts of the original flowers remain attached, forming an additional covering. It is to be expected that the removal of this outer coat will facilitate germination by reducing both the amount of moisture necessary and the time required for it to penetrate to the actual (or true) seeds and induce their germination.

Two methods of decortication (i.e., removal of the outer coat) are available in practice, namely (1) corroding or burning away with an acid, such as strong sulphuric acid, and (2) mechanical "milling" by means of special machinery. The former process actually chars away part of the coat without injury to the seeds within. Since the acid can penetrate between the several single-seeded fruits constituting the cluster, it tends to split them apart, thereby increasing the number of separate fruits, each containing one seed, and reducing the number of true seeds in each cluster. Mechanical decortication, on the other hand, whilst grinding away some of the outer coat and reducing the size of the clusters, does not split them apart to the same extent as is obtained by treatment with acid.

Preliminary experiments on methods of decortication and on the use of decorticated seed were begun at the University

* This Report has been prepared for publication by the writer at the request of the Eastern Counties Provincial Agricultural Conference. The field work in connexion with the experiments was carried out by the Agricultural Education Staffs of the counties in the province and the Staff of the Cambridge University Farm.

VALUE OF DECORTICATED SUGAR-BET SEED

Farm, Cambridge, in 1927, and were continued by various members of the staff of the Farm and the School of Agriculture during the succeeding three years.^{(1)(2)*} By the end of the season, 1930, it was felt that sufficient evidence of the value of decorticated seed had been obtained to justify its trial on a more extended scale, and a series of experiments was therefore undertaken in 1931 by the Eastern Counties Provincial Conference. These experiments were continued in the two succeeding seasons, 1932 and 1933. During these three years, experimental work was also continued on the University Farm; this work was, however, of a more involved nature than that undertaken by the Provincial Conference, and a detailed report of a portion of it has already appeared.⁽¹⁾ The results obtained at this centre will therefore be included in this article only in a summarized form, to bring them into line with other centres in the Province.

Experimental Procedure:—1931.—Arrangements were made with the Zuckerfabrik Klein-Wanzleben for supplies of seed of their Kleinwanzleben E strain, decorticated by means of sulphuric acid; also, of untreated seed from the same stock. At each experimental centre, an attempt was made to compare treated and untreated seed at the same and at different rates of seeding. This seemed desirable in view of the fact that there are obviously more seeds per lb. of treated than of untreated seed, and any beneficial effect from treatment, where equal weights of seed per acre are used, might be due to the larger number of separate seeds sown. The actual seeding rates suggested were 17 lb. untreated, 17 lb. and 12-14 lb., respectively, treated seed per acre, there being usually five replicate plots of each seed-rate at each centre. Some centres, however, included additional seed-rates, going as high as 26 lb. untreated seed per acre; while the University Farm experiment included mechanically-milled seed. The attainment of any particular seed-rate in practice proved very difficult, since ordinary farm drills were used, and, as already mentioned, treated seed is smaller than untreated seed and therefore enhanced the difficulty of determining the correct drill-setting for any desired seed-rate. Information obtained in the more detailed experiments on the University Farm⁽¹⁾ indicated quite clearly that the benefits accruing from the use of treated seed were not caused primarily by differences

* For references, see page 28.

VALUE OF DECORTICATED SUGAR-BEET SEED

in number of seeds sown per acre, hence comparisons made for the 1931 season deal with cases where equal seed-rates were attempted. In support of this procedure it might be added that most growers would consider 17 lb. per acre an adequate seed-rate.

Observations were made at each centre throughout the growing season. Singling was carried out as with an ordinary farm crop, the object being to leave the beets spaced as nearly as possible 9 in. apart in the row on all plots. At harvest, the beets were lifted, knocked as free as possible from adhering soil and carefully topped. The roots on each plot were then weighed, and a sample of 50 roots from each plot was taken for the determination of dirt tare and sugar-content.

1932.—Procedure was almost identical with that adopted in 1931, except for the inclusion of mechanically-milled seed at all centres, and the use of duplicate bulk samples of roots from each treatment (instead of samples from each individual plot) for the determination of dirt tare and sugar-percentage. This latter modification was adopted because previous trials had, as might have been expected, failed to disclose any significant differences in the amounts of dirt tare, or sugar-content as between treated and untreated seed; and differences between treatments, therefore, were much the same, whether considered on the basis of washed or unwashed beet. It was intended to sow the mechanically-milled seed at approximately the same rate per acre as the acid-treated seed in 1932, viz., about 14 lb. per acre as against 17 lb. per acre of untreated seed, though it was obvious that the actual seedings attained varied somewhat in practice.

1933.—The experiments were on similar lines to those of 1932, mechanically-milled seed again being included at most centres.

Results:—1931.—The appearance of the treated seed suggested that the acid-treatment had not been carried out as completely as with the seed used on the University Farm in previous seasons. Inquiries showed that the reason for this was the adoption of commercial methods of acid-treatment in place of the small-scale laboratory methods previously used. The circumstance that the seed was less thoroughly decorticated undoubtedly influenced the results obtained in this season. It should be stated, however, that

VALUE OF DECORTICATED SUGAR-BEET SEED

the method of treatment on a commercial scale was improved in time to permit of the seed for the 1932 and 1933 experiments being adequately decorticated.

Experiments were carried out at seven centres in 1931, distributed in four counties, viz., Cambridgeshire, Essex, Hertfordshire and Norfolk. Observation plots were also put down at four centres in East and West Suffolk.

Seed-beds at all centres were good, both as regards tilth and moisture conditions. Weather after seeding was generally wet or showery, so that, although the temperature was rather low, conditions on the whole were favourable for germination. Nevertheless, observations at the time of brairding showed that at seven centres, seedlings from the acid-treated seed showed above ground from one to two days earlier than those from the untreated seed, despite the inadequacy of the treatment referred to above. At three centres this initial advantage was still apparent at singling time.

Differences in plant population and yield of washed beet per acre, from equal weights of treated and untreated seed, were small. The seven centres provided eight comparisons (one centre affording comparison at two different rates of seeding). In six of the eight cases, treated seed gave an increase in plant population, the average increase being 849 beets per acre. The yield of washed beet from the treated seed, however, exceeded that from the untreated in only four of the eight cases, the average increase being negligible. Mechanically-milled seed, used at one centre only, gave results very similar to acid-treated seed.

1932.—Experiments were carried out at eight centres in the same counties as in 1931, and provided, with the experiments on the University Farm, nine comparisons of acid-treated, mechanically-milled and untreated seed. Observation plots were again put down in Suffolk. Seed-beds were generally good, but weather conditions rather dry. The acid-treatment of the seed had been carried out more satisfactorily than in 1931, and, in almost all instances, the seedlings from the treated seed showed above ground from one to three days earlier than those from the untreated seed and gave a fuller and more regular "plant." Mechanically-milled seed appeared to be intermediate between untreated and acid-treated seed as regards rate of brairding. As in 1931, the initial advantage shown by the acid-treated seed was rarely obvious at singling time except at certain centres,

VALUE OF DECORTICATED SUGAR-BEET SEED

where the more satisfactory plant establishment was still noticeable. At lifting time, the plant populations on the acid-treated seed plots were higher than on the untreated seed plots at all nine centres, the average increase being 1,985 beets per acre, or approximately 8 per cent. Again, the acid-treated seed gave an increased yield of roots at eight of the nine centres, the average increase being 0.41 tons per acre of washed beet, i.e., 3.1 per cent. The increase in plant population was statistically significant at two of the nine centres, but the increase in yield of roots reached significance at only one centre.

Comparison of the results from the acid-treated and mechanically-milled seed showed that the former gave a higher plant population at seven of the nine centres, but a higher yield of roots at only four of them. The average difference in plant population was 1,235 beets per acre, and in yield of roots 0.17 tons of washed beets per acre, both in favour of acid-treated seed.

Comparison of the mechanically-milled and the untreated seed showed that the former gave a higher plant population at six of the nine centres, but a higher yield at only four of them. The average increase in plant population was only 750 plants per acre, and in yield 0.24 tons of washed beet per acre.

The effects of mechanical milling therefore appear to have been less beneficial than the effects of decortication by sulphuric acid.

1933.—Experiments were carried out at five centres in Cambridgeshire, Hertfordshire, Norfolk and Kesteven, making, with the University Farm, six centres in all. Observations were also available from centres in Essex and Suffolk. Seed-beds were again good as regards tilth, but weather conditions were generally dry.

Seedlings from acid-treated seed showed above ground from one to five days earlier than those from untreated seed, and again appeared to give a rather fuller and more uniform "plant," though there was rarely any visible difference in the size of the seedlings at singling time. At lifting time, counts and weighings showed that the acid-treated seed had given a larger plant population than untreated seed at five out of six centres and a heavier yield of washed beet per acre at four out of six centres. The increase in plant population was statistically significant at three centres and the increase in yield at one centre. The average increase in

VALUE OF DECORTICATED SUGAR-BEET SEED

plant population for all centres was 2,140 beets per acre, i.e., 8.8 per cent., and in yield was 0.36 tons of washed beet per acre, i.e., 4.9 per cent.

The results from the mechanically-milled seed were again intermediate between those from the acid-treated and the untreated seed.

Factory Trials.—In view of the evidence available at the conclusion of the experiments of 1932, the value of acid-treated seed was brought to the notice of the various Beet-Sugar Factory Committees, with the result that three factories in the Province obtained several hundredweights of acid-treated seed in the spring of 1933 and arranged for a number of their growers to try it alongside untreated seed. No quantitative data were obtained, but observations made by the growers and the factory fieldsmen showed that the growers were generally pleased or satisfied with the results from the treated seed. The following information, taken from a report supplied to the writer by the chief agriculturist at one of these factories, may be of interest:—

“ With one exception, growers considered that decorticated seed germinated more rapidly than untreated seed. Two-thirds of the growers thought that the crop maintained the advantage it got from earlier germination and about the same number felt that they had better ‘ stands ’ from decorticated seed.”

Summary of Results.—(1) Acid-treated seed brairded from one to five days earlier than untreated seed and gave a more uniform “ plant.”

(2) Acid-treated seed gave a larger plant population than untreated seed in 21 out of 23 experiments over a period of three years. The two occasions on which an increase in plant population was not obtained occurred in 1931, when seed-bed and moisture conditions were generally favourable to germination, and the treatment of the seed was not properly carried out. Although the increase in plant population was not always statistically significant at individual centres, the fact that an increase was obtained in 21 out of 23 experiments is sufficient to justify the statement that the effect of acid-treatment was definitely significant, the increased plant population being due to the acid-treatment and not to chance variations in soil and other conditions.

VALUE OF DECORTICATED SUGAR-BEET SEED

(3) Acid-treated seed gave a heavier yield of washed beet per acre than untreated seed on 16 out of 23 occasions. Though the increase was rarely significant at any one centre, its recurrence on 16 out of 23 occasions is sufficient to justify the assumption that, in general, acid-treatment had a beneficial effect on yield. It should again be noted that four out of the seven occasions on which no increase in yield was obtained occurred in 1931—a year when results were affected by circumstances already explained.

(4) Mechanically-milled seed gave results intermediate between acid-treated and untreated seed, both as regards plant population and yield of washed beet. Though the differences between the results from acid-treated seed and mechanically-milled seed were not significant, the experiments indicate that mechanical milling, as carried out in the seasons under review, was generally less effective than acid-treatment.

(5) Neither acid-treatment nor mechanical milling produced any effect on sugar-content.

Conclusions.—(1) Decortication of sugar-beet seed by means of sulphuric acid has in general proved beneficial both as regards rate of brairding, uniformity of "plant" and yield of washed beet.

Quicker brairding enables earlier horse hoeing to be done, whilst more regular brairding facilitates correct spacing when the plants are singled.

(2) The beneficial effects may be relatively small when conditions governing plant establishment are favourable, but they tend to be more pronounced when conditions are less favourable. The treatment may therefore be looked upon as a form of insurance against poor plant establishment. The increased rate of brairding is likely to be of special value when conditions at sowing time are rather dry or when drilling takes place late in the season.

(3) Though no reduction in the usual rate of seeding can be recommended when acid-treated seed is substituted for untreated seed, the present cost of acid-treated seed is approximately only 2d. per lb. more than that of untreated seed, and its use involves therefore an additional expenditure on seed of only 2s. 6d. to 3s. per acre. To meet this increase in expenditure, though no increase in yield may be obtained in a season when conditions are favourable for germination, increases of as much as 15 to 20 cwt. of washed

VALUE OF DECORTICATED SUGAR-BEET SEED

beet per acre were obtained in six of the experiments under review, and an increase of $1\frac{1}{4}$ tons of washed beet per acre was obtained on the University Farm in 1929⁽¹⁾ when conditions at seeding time were definitely dry and unfavourable to germination.

(4) Acid-treatment must be properly carried out if its full benefits are to be obtained. Any fault in the mode of treatment adopted may result in too little of the seed covering being removed, as was the case, to some extent, in the 1931 experiments described in this article.

(5) Decortication by mechanical means has so far proved less satisfactory than acid-treatment.

It is hardly necessary to point out that the treatment of seed with sulphuric acid involves not only certain risks, but also a chemical operation which it is impossible for a farmer to carry out. At present the treatment is done by seed firms or by chemical factories equipped with facilities for handling sulphuric acid in bulk.

The writer is indebted to Dr. H. G. Sanders for assistance with the statistical analysis of the experimental data.

REFERENCES.

(1) Garner, F. H., and Sanders, H. G. (1932), *J. Agric. Sci.*, XXII, 551.

(2) Hanley, F., and Woodman, R. M. (1930), *J. Soc. Chem. Ind.*, XLIX, 215.

THE VALUE OF FARM PRODUCE CONSUMED IN THE FARM-HOUSE

W. H. LONG, M.A., and C. DANIEL, N.D.A., N.D.D.,
Seale-Hayne Agricultural College, Newton Abbot.

MOST records of farming profits and losses include, in addition to cash sales, estimates of the value of farm produce consumed in the house. Usually, however, these figures are presented as part and parcel of the cash sales, as indeed is only right in studying the efficiency of the farm as a producing unit. At the same time, this method of presentation tends to obscure another very important aspect of farming, namely, the value of the farm produce in reducing the cash living expenses of the farmer and his household.

The following article attempts to give some idea of the extent to which farmers rely on home-produced food for their own requirements. The financial accounts of 59 farmers have been investigated, and from them the estimated value of produce consumed in the farm household has been extracted. Before discussing these figures, two points need to be explained:—

Estimates of farm produce consumed are usually based on the price the produce would have brought to the farmer if he had disposed of it through the usual channels, and not on the price that his wife would have had to pay if she had bought in the retail store. There is sometimes a large disparity between these amounts. To take what is probably the extreme example, the retail price of milk is usually 6*d.* per quart; the milk-selling farmer would probably credit his farm account with 1*s.* per gallon (only half the retail price) and the producer of manufacturing-milk would probably charge his milk at about 8*d.* or 9*d.* per gallon. In most items, the disparity between farm price and retail price would be less than this, but it would be significant.

The second point is that the value of the actual food, etc., consumed is only a part of the social and economic advantages which are claimed for living on a farm. The items discussed below include dairy produce, poultry and eggs, pigs, lambs, potatoes, apples and cider, and wood. Nothing is allowed for the rent and rates of the farm-house, which

FARM PRODUCE CONSUMED IN THE FARM-HOUSE

are always included in the farm expenses. On some farms, the value of manual labour in the garden and elsewhere, and of horse labour for hauling, is considerable, while the fact that the farmer can usually grow all his vegetables in his own kitchen garden is a significant factor in reducing his household expenses. Further, where a farmer keeps a car, the fact that it is used partly for farm work may justify him in keeping what would otherwise be an unobtainable luxury, or, where the demands of the farm itself entitle him to incur this expense, enable him to use the car for a certain amount of private running at a nominal cost.

Table I shows the value of the produce actually produced on the farm and consumed in the house on 59 Devon and Cornish farms. The figures, as indicated above, are based on farm and not retail prices.

TABLE I.—VALUE OF FARM PRODUCE CONSUMED IN THE FARM-HOUSE ON 59 DEVON AND CORNISH FARMS.

	<i>Average value of produce consumed per farm.</i>			<i>No. of farms consuming product.</i>	<i>Average value of produce on those farms consuming product.</i>		
	£	s.	d.		£	s.	d.
Dairy produce ...	22	7	9	59	22	7	9
Poultry and eggs ...	10	11	6	57	10	19	0
Pigs ...	3	17	6	26	8	15	11
Lambs ..	14	9		6	7	4	2
Potatoes ..	3	13	4	53	4	1	8
Apples and cider ...	19	0		15	3	14	6
Wood ..	7	3	11	49	8	13	4
	<u>£49 7 9</u>						

Easily the most important item was dairy produce. In value, it was responsible for more than two-fifths of the total figures, and it was also the only item that was consumed on every farm. Most farms consumed home-produced poultry, eggs and potatoes, while wood had a significant value on the majority. Less than half the farms killed a pig for home consumption, while home-killed lamb was the exception rather than the rule.

The importance of apples and cider depends mainly on the district. In east, mid-, and south Devon most farms have an orchard, but the importance of apples and cider is not great in the rest of Devon or in many parts of Cornwall.

- These 59 farms averaged £49 7s. 9d.—or slightly less than £1 per week—as the value of farm produce consumed

FARM PRODUCE CONSUMED IN THE FARM-HOUSE

in the house. The average size of the farm family, including domestic servants and men boarded in, was 4.78. A certain amount of estimation was necessary in arriving at this figure, but it is believed that it is very near the truth. If there is an error in it, the fault probably lies in underestimating rather than in overestimating. On 12 farms, the actual numbers were taken from Income Tax form 79 D. These averaged 4.58 persons per farm.

The foregoing analysis of dairy and poultry produce is not so detailed as might be desired, but on the majority of the farms the records were not split up further than this. On 24 farms, however, an additional analysis of dairy and poultry produce was available, and Table II presents the data for this smaller number of farms more fully.

TABLE II.—VALUE OF DAIRY AND POULTRY PRODUCE
CONSUMED IN THE FARM-HOUSE ON 24 DEVON
AND CORNISH FARMS.

	<i>Average value of produce consumed per farm.</i>			<i>No. of farms consuming produce.</i>	<i>Average value of produce on those farms consuming product.</i>		
	£	s.	d.		£	s.	d.
Milk	7	17	9	24	7	17	9
Butter	9	19	0	24	9	19	0
Cream	7	3	2	23	7	9	5
Poultry	4	16	0	23	5	0	2
Eggs... ..	5	16	0	24	5	16	0
	£35	11	11				

The average number of residents on this group of farms was 5.16.

If the milk is valued at 1s. per gallon, this gives an annual consumption of 245 pints of milk per head per year, or about 0.67 of a pint per day. If the milk is valued at 9d. per gallon, this would indicate a consumption of 0.89 of a pint per day. The figures are slightly complicated by the fact that some buttermaking farms consume a good deal of separated milk in the house, but this would not vitiate the foregoing figures if they are regarded as whole milk equivalents. It is interesting to compare these figures with some given by Smith,* which indicate the variations in consumption that occur amongst different classes of consumers. Smith found that the average milk consumption per head in four Cornish towns was $\frac{1}{2}$ pint per day with variations

* The figures given in this article are based on prices and conditions ruling in 1931-32

FARM PRODUCE CONSUMED IN THE FARM-HOUSE

from an average of 0.83 of a pint for a seaside resort to 0.29 of a pint in an industrial town. Compared with these figures, farm consumption seems satisfactory, but it is still considerably below the dietician's ideal.

The consumption of farm butter amounted to more in value than the consumption of any other form of dairy and poultry produce. At an average price of 1s. 3d. per lb. this would represent a consumption of 160 lb. of butter per year, or about 31 lb. per person.

Clotted cream in Devon and Cornwall is regarded more as a partial substitute for butter than as a luxury, and, as Table II shows, the value of the cream consumed is not much less than the butter. The price of cream is practically the same as that of butter, per lb., and this indicates a consumption per head of about 23 lb. per year.

Poultry may represent 3-4-lb. chickens at 1s. per lb., or may refer to old hens suitable only for boiling. Their value at £5 per farm indicates an annual consumption of between 30 and 40 birds.

Eggs would average in price about 1s. per dozen on the farm throughout the year, and this indicates a consumption of 116 doz. per farm, or about 22½ doz. per head. Apparently, therefore, the farm household requires 3 eggs per head in 4 days, and this, taking into consideration the high value of eggs from the dietetic standpoint, rather suggests that a more prominent place might be given to eggs in the diet, at any rate in months when the price is low.

The detailed examination of the amounts of dairy and poultry produce consumed, compared with the other items of Table I is, it is felt, justified by the fact that very few farm households use any dairy and poultry produce apart from what comes off the farm. Most of the other items are only part of the total consumption—pigs and lambs represent no more than a fraction of the meat consumed, apples are not the only fruit, and cider is often more important as a payment in kind to the farm workers generally than as a beverage whose use is confined to the residents of the farm house.

The general conclusion to which a study of the foregoing figures leads is that the indirect values which the farm has in addition to the cash receipts are by no means negligible. In fact, on the basis of these figures it would be difficult to assess this value at much less than £100 a year on most farms in the area surveyed, taking into consideration the

FARM PRODUCE CONSUMED IN THE FARM-HOUSE

difference between retail prices and the wholesale values on which the tables are based, and the other items such as rent and rates of the farm-house, which are not included in the above analysis. It is not suggested here that none of these allowances is usually made. Farm accounts always include the estimated value of farm produce consumed in the house, and usually take account also of such items as farm labour used in the garden. The only item that is scarcely ever allowed for is the rent of the farm-house, and this, in fact, is difficult to assess since the farm-house is itself part of the farm and can with difficulty be considered without it.

While £100 makes a very useful addition to the cash returns that farming supplies, the disadvantages of farm life must not be ignored. There is little to suggest from the foregoing analysis that the economic value of farm life goes very far in compensating farmers for the fall which they have experienced in the prices of their crops and stock for sale.

THE TABLE POULTRY INDUSTRY

P. A. FRANCIS, O.B.E.,

Poultry Commissioner, Ministry of Agriculture and Fisheries.

WHILST the production of table poultry is more or less closely allied with egg production, the channels and methods by which table poultry reach the consumer differ considerably from those used for eggs. The distinction is perhaps not so clearly defined as, say, that between the methods of marketing fat cattle and those for milk, but many of the problems involved in the marketing of table poultry are widely different from those connected with egg marketing. It should also be borne in mind that the production and trade in table poultry are of less money value than eggs, which form so important a part of the nation's daily dietary. In most households, poultry is something of a luxury, and in a large number of instances never appears in the household diet at all, unless it be at Christmas time.

The following tables show the relative estimated total quantities and values of the eggs and poultry available for consumption in Great Britain for the years 1913, 1924 and 1931, and also the proportion of home produce in the total supplies for each of these years.

These tables show that, whereas in 1931 the total supply of eggs in Great Britain was valued at about £34,000,000, that of table poultry was valued at £11,000,000, and that the value of the home-produced table poultry was estimated at little more than a third of the value of home-produced eggs. The table poultry industry is, however, one of considerable importance and offers possibilities for further expansion, since although in 1931 home production in Great Britain was valued at over £7,000,000, imports were valued at nearly £4,000,000 and represented some 44 per cent. of the total supplies in that year. It should not, however, be concluded from these figures that the total replacement of imported poultry with home supplies is a simple problem. Many factors are involved—price levels, season of supply, suitability for particular classes of demand, etc.

Available figures and estimates indicate on the surface that the expansion of table poultry production in Great Britain since 1913 has been much less, relatively, than that of eggs, for whilst between 1913 and 1931

THE TABLE POULTRY INDUSTRY

GREAT BRITAIN.

Eggs (excluding hatching, but including an allowance in respect of production on holdings of 1 acre and under).

	1913		1924		1931	
	Quantity	Value	Quantity	Value	Quantity	Value
	Millions	Millions £	Millions	Millions £	Millions	Millions £
Home Production	1,413(a)	6.4 (a)	2,170(b)	15.7 (b)	3,706 (c)	19.7 (c)
Net Imports ...	5,325	12.5	2,604	16.6 (d)	3,308	14.6 (d)
Total Supply	4,738	18.9	4,774	32.3	7,014	34.3
Proportion of Total Supply Home Produced	% 30		% 45		% 55	

(a) Includes estimates for Scotland for the twelve months ending May, 1914.

(b) Includes estimates for Scotland for the twelve months ending May, 1925.

(c) Includes estimates for Scotland for the twelve months ending May, 1931.

(d) Includes the net exports from Northern Ireland valued at the average declared value of imports into the United Kingdom.

Poultry, Alive and Dead (including an allowance in respect of the production of fowls on holdings of 1 acre and under).

	1913		1924		1931	
	Quantity	Value	Quantity	Value	Quantity	Value
	000 Cwt.	Millions £	000 Cwt.	Millions £	000 Cwt.	Millions £
Home Production	856(a)	4.2 (a)	839(b)	6.3 (b)	1,095 (c)	7.4 (c)
Net Imports ...	586(a)	1.9 (a)	456	2.4 (d)	849	3.8 (d)
Total Supply	1,442	6.1	1,295	8.7	1,944	11.2
Proportion of Total Supply Home Produced	% 59		% 65		% 56	

(a) In respect of the twelve months ending May, 1914.

(b) " " " " " 1925.

(c) " " " " " 1931.

(d) Includes the net exports from Northern Ireland valued at the average declared value of imports into the United Kingdom.

THE TABLE POULTRY INDUSTRY

home production of eggs is estimated to have risen from 1,413 millions to 3,706 millions—an increase of 162 per cent.—home production of table poultry rose from 856,000 cwt. to 1,095,000 cwt., an increase of only 28 per cent. These figures, however, are not strictly comparable, because in 1913 the average egg yield per hen was taken as 75, while in 1931 it was taken as 120, and the figures for table poultry production include turkeys, geese and ducks, and during the period turkeys and geese showed an actual decrease. Further, from the point of view of competing with imports, the leeway to be made up in connexion with supplies of table poultry was not so great as with eggs, for whilst in 1913 home supplies of the former represented some 59 per cent. of the total, home supplies of the latter represented only about 30 per cent. of the total egg supplies. By 1931 the proportion of home-produced eggs rose to 53 per cent. but home supplies of table poultry, although slightly less in proportion than in 1913, still accounted for 56 per cent. of the total supplies. Home production of poultry actually increased during this period by 28 per cent., and the estimated consumption per head of the population had gone up from about 3.9 to 4.6 lb.

Imports of poultry into Great Britain in 1913 were 586,000 cwt. valued at nearly £2 millions. By 1931 these imports had risen for 849,000 cwt. valued at £3.8 million. These supplies come mainly from foreign countries and only to a very small extent from countries within the Empire, with the exception of the Irish Free State, which now provides about 20 per cent. of our imports of dead poultry and about 68 per cent. of the imported live birds. In 1913 the major part of the imports of live poultry came from France, Belgium and Italy; whilst Russia supplied nearly half the total imports of dead poultry, and considerable quantities also came from the United States, France, Austria, Hungary, Italy and China. The sources of supplies have now changed considerably, the greater part of the dead poultry being supplied by Hungary and the Irish Free State, while only about 8.5 per cent. arrived from Russia in 1933, though it must not be forgotten that supplies reach us from new countries—such as Latvia—that were formerly part of Russia, and that imports from Russia fell in 1933 by about 60 per cent. as compared with 1932. A large quantity of the total imports arrive during the months of December and January and consist largely of turkeys (many of which

THE TABLE POULTRY INDUSTRY

come from Hungary and Eastern Europe) for the Christmas and New Year trade. Turkeys are also imported during November and February, whilst from June to September a limited number arrive from South Africa, Australia and the Argentine. Considerable shipments of geese formerly came in largely from France and Russia, mainly for the Christmas and New Year trade, but since the imposition of tariffs these imports, except those from the Irish Free State, have become almost negligible. Ducklings are imported from about January to the end of April, when but few English supplies of the quality required are available. There are also some imports of guinea fowls which meet some demand here after the season for English game is over. Foreign chickens are mostly imported during the winter months, though supplies arrive all the year round.

Home Supplies—Table Chickens.—Speaking generally, the bulk of home supplies of table chickens is produced between January and the end of April as a by-product in the rearing of laying stock. These chickens, which consist chiefly of male birds, therefore come on to the market roughly from May till the end of August. According to the figures obtained in respect of June 3 last under the Agricultural Returns Act, there were at that time in England and Wales on agricultural holdings exceeding an acre 33,735,000 fowls under six months old. On a rough assumption that one-half this number were males and that 90 per cent. of them were marketed as table chickens, apparently something like 15,000,000 male chickens came into the table poultry market during the four months June to September. Assuming this marketing period to spread over about 16 weeks, then nearly a million chickens per week would be supplied to English markets during that time. In addition to this main supply of chickens, "culled" hens come on the market more or less throughout the year, but especially in the autumn. There is a certain irregular quantity of chickens that are hatched on farms and small holdings after April, and the specialized production from poultry farms that hatch chickens in the autumn for the spring trade, and the output from fatteners of the Sussex type.

Taking these supplies of table fowls as a whole, there is a scarcity of British chickens on the market from about January to June, large supplies from June to September, and moderate supplies for the remainder of the year.

The Table Poultry Industry

Turkeys.—Turkeys are produced almost entirely for the Christmas market. According to provisional estimates, the output of turkeys for the table, on agricultural holdings in England and Wales in 1932-33, was 440,000. Assuming an average weight per bird of 12 lb., then the total weight of table turkeys produced last year in England and Wales would be 47,000 cwt. The total imports of turkeys into the United Kingdom for 1933 are given as 255,656 cwt. of which 68,565 cwt. came from Empire sources, mainly from the Irish Free State but also from Canada, Australia and South Africa. Turkey production in England and Wales for 1932-33 was, with the exception of the previous year, less than in any year since 1924-25, but the census figures for June, 1933, indicate that in the spring of 1933 much larger numbers of turkeys were hatched, since the numbers on agricultural holdings were 17 per cent. greater than for any year since 1908.

Geese.—Supplies of geese in England and Wales were a little greater in 1932-33 than in the previous year, but still showed a decline as compared with every other year since 1925-26. Some 520,000 geese, produced in England and Wales, were marketed for the table in 1932-33. These birds are mainly produced for the Christmas market, although considerable numbers are also sold at Michaelmas. The demand for green geese, i.e., young goslings, is now practically negligible.

Ducks.—Supplies of home-produced ducks reach the markets during most months of the year, the larger supplies being marketed from June to September and again at Christmas time. Large quantities of ducklings of the Aylesbury type are now produced in Norfolk, Bedford and Suffolk, particularly in Norfolk in the neighbourhood of Wymondham. There is a scarcity of home-produced ducklings in the market from about January to June. Old ducks and ducklings of various ages and types come into the market in the autumn and until Christmas time in considerable quantities. It is estimated that 2,600,000 ducks produced in England and Wales on agricultural holdings were consumed in 1932-33. This is approximately the same number as was consumed each year since 1924-25.

Probable Causes of Imports.—The use of imported supplies and dependency upon them have no doubt become habitual in our markets, and certain vested interests dealing

~~THE TABLE POULTRY INDUSTRY~~

with imported supplies have been built up, but unless such supplies satisfied a real demand on a competitive basis for price and quality it is doubtful if they could have continued as they have done. These imports may be explained on several grounds. First as to the question of price: if the prices obtained for Hungarian chickens during 1933 are compared with those obtained for comparable English birds (which, however, are fresh, whilst the Hungarian are cold stored) it is found that prices for the Hungarian birds varied during the year from 8½d. to 1s. 1d. per lb. whilst the prices for the English birds varied from 9½d. to 1s. 4d. per lb. During the period—March to June—when Russian imports were highest for the year, the prices realized varied from about 10½d. to 1s. 1d. as compared with 11½d. to 1s. 4d. for English. If the best quality Dutch chickens are compared with first-quality "Surreys," then it is seen that for the year prices for the Dutch birds (white) varied from 1s. 1d. to 1s. 6d. whilst the variation for "Surreys" was from 1s. 1½d. to 1s. 6d. These are all wholesale Smithfield prices.

It is, however, not merely a question of price, but of type, seasonality of supply, quality, condition when marketed, and keeping qualities. Russian chickens, for example, are birds with small bones, weighing about 2 lb. each, are marketed well-conditioned, properly graded and packed, and arrive here frozen, so that they can be kept for an indefinite period in cold-store before being used. These birds before the War used to provide the half chicken that could be obtained at many restaurants for 1s. 6d.; they are now sold wholesale at Smithfield at about 10d. per lb., so that the wholesale price for the bird is about 1s. 8d. and the retail price probably from 2s. to 2s. 6d. The Hungarian chicken is a cold-stored bird of uniform type. It has been well-conditioned and arrives here in a standardized form weighing about 2½ lb. per bird, less or more, according to the grade packed. The Dutch chicken is in rather a different category since it arrives in our market fresh or chilled. It is a soft-fleshed, plump bird of good quality and is the product of a special industry that has grown up in North Holland in recent years. These birds are almost equal in quality to the best English "Surreys" except that the latter have usually been crammed, whereas the Dutch birds have merely been trough-fed or conditioned. There are few, if any, English chickens comparable in type and quality to the Dutch birds that reach our markets in the same standardized form and are available in such regular quantities.

All these imported birds meet a definite demand at certain price levels, and the bulk of them are imported to meet the shortage of supply in British chickens that occurs, as before stated, from about January to June. Restaurants, hotels and other forms of catering establishments require supplies of chickens of particular types and qualities more or less all the year round, and table poultry salesmen at Smithfield have frequently stated that they are obliged to import foreign birds to maintain continuity of supply to their customers, and that if this continuity of supply were lost the consumption of table poultry would suffer a definite reduction.

Home Production.—Home supplies of table poultry are

The Table Poultry Industries

produced mainly by three classes of producers: (a) the specialist table poultry farmer, (b) the commercial egg farmer, and (c) the general farmer and smallholder.

Chickens.—Much the largest part of the home supplies of chickens comes from general farms and small holdings, and these supplies, together with those from commercial egg farms, include the bulk of the poorest quality birds that reach the markets and are largely sold during the period of low prices. For some years before the War large supplies of table chickens of good quality used to reach the London markets from the Boston district of Lincolnshire, from Devonshire and from counties on the Welsh borders. These supplies have now practically ceased. Producers in these areas appear to have turned their attention more and more to egg production and their surplus birds are apparently disposed of in local markets. The surplus birds of the general farmer and small holder are now mostly sold in local markets or to local dealers with little attempt at either conditioning or grading. On the surface, it is perhaps difficult to explain why the farmer's chicken nowadays should not be just as good as it was 30 years ago, because, generally speaking, farmer's poultry are better cared for and better fed now than they were in pre-War days. In the old days, however, Asiatic breeds, American breeds—such as the Barred Rock—and the Old English Barndoor fowls which contained some Dorking, Sussex, or Game blood, were more generally kept; these birds produced chickens of better table type than the breeds that are most generally in use to-day and that have been bred and selected for egg production rather than for their table qualities. Further, even on farms, methods of breeding and rearing are more intensive than they were years ago, when a limited number of birds ranged the farmyard and were allowed to mature into birds of good size before being sold for the table.

The commercial egg farmer mainly provides table poultry as a by-product, and he is not always entirely, or even mainly, an egg farmer, but may be a general farmer who has built up a specialist poultry department on the farm, where hatching for egg production only is carried on. Practically all the table poultry are produced during the spring months from January to May, but in an increasing number of instances, especially in East Anglia, Gloucestershire, Somerset and elsewhere, egg farmers who breed Rhode Islands and Wyandottes for egg production mate these birds later in the season with Sussex cockerels and start hatching and rearing again for the production of table chickens for the following spring market. This is a development that deserves every encouragement; while it enables the farmer to make a more continuous use of his equipment, breeding stock and staff, it also increases supplies of home chickens for the market during the spring and early summer when home supplies are normally scarce. In an increasing number of instances, too, poultry farmers are undertaking contracts for supplying table chickens more or less all the year round to packing stations.

Sussex, particularly East Sussex, is practically the only area in which the production of table poultry forms the chief part of the industry. It has been estimated that table poultry represents 60-70 per cent. of the total output of the poultry produce of this country. Specialized production is also carried on to a less extent in Kent, Surrey and Gloucestershire, but even in these areas it occupies a very secondary position compared with egg production. In practically all other counties in England and Wales egg production is by far the largest branch of the industry, and the main supplies consist of surplus cockerels and discarded pullets and hens. In some counties, such as Cornwall and Lancashire, large quantities of White Leghorns are kept, but, taking the country as a whole, this breed is now probably decreasing in numbers. As it is kept entirely for egg production and is therefore hatched mostly in April and May, the cockerels

THE TABLE POULTRY INDUSTRY

are ready for the market at a time when prices are low, unless they are sold as *petits-poussins*, at about eight weeks old. The market for *petits-poussins*, however, is a limited one, and even then the price obtained is not always satisfactory. The result is that considerable numbers of White Leghorn cockerels are destroyed as soon as their sex can be determined.

Table poultry production in Sussex and the adjoining counties is a very old industry, and the skill of the Sussex fatterer is traditional of the area. It is here that the finest "Surrey" chickens are produced, birds that are equal or superior to the product of any country in the world. These crammed birds, however, which make weights of from 4—6 lb., and often considerably more, have a definitely limited market—mainly in the London area. The fatteners do not usually rear their own chickens but purchase them from rearers and—nowadays only to a limited extent—import store cockerels from Ireland. "Surrey" chickens of the best quality are largely in demand during the London season, but are also marketed practically throughout the year.

Turkeys.—There are no farms devoted solely to the production of turkeys, which are reared by farmers and smallholders. Turkeys are kept in all counties in England and Wales, but as regards numbers, Norfolk heads the list, followed by Devon, Suffolk and Essex. Turkeys are also extensively kept in Shropshire, Somerset, Yorkshire, Lincoln and Cornwall. The number of turkeys in England and Wales showed a tendency to fluctuate between 1908 and 1932, the numbers kept in the latter year being considerably less than in 1908. The agricultural returns for June, 1933, however, showed an increase over the previous year of over 46 per cent., bringing the total to the highest ever recorded. This increase is probably a reflection of the satisfactory prices realized for English turkeys at the end of 1932.

English turkeys, particularly those from Norfolk and East Anglia, generally realize the highest prices in our markets. They are considered to be superior in quality to any other birds, and on the average are also considerably heavier in weight than imported birds. During November and December, 1932, English turkeys were quoted from 1s. 4½d. to 1s. 6½d. per lb., Irish from 1s. 0½d. to 1s. 4½d. per lb., Italians from 11d. to 1s. 1½d. per lb., and Hungarian from 9½d. to 11½d. per lb.—all Smithfield wholesale prices. Prices were rather lower than these figures for the Christmas market in 1933, English turkeys being then quoted from about 1s. 0d. to 1s. 4d. per lb., whilst French turkeys were quoted from 11d. to 1s. and Argentine birds from 9d. to 11d.

Geese.—As with turkeys, the numbers of geese showed a fluctuation between 1908 and 1932, but slight increases have been recorded since 1931, the 1933 figures being only slightly lower than those for 1908. The principal goose-keeping counties are Yorkshire, Devon, Lancashire and Cumberland, whilst Wales contains nearly 25 per cent. of the total geese in England and Wales. The public demand for geese for table purposes is not so great as in former years, and whilst home production has been maintained during recent years at a more or less steady level, imports appear to have fallen off considerably, especially since the imposition of tariffs.

Ducks.—Home supplies commence about April and last until December. Between December and April the market has been accustomed to rely mainly upon frozen ducklings received from the United States and China, and upon odd lots of home produce. Duck breeding for table purposes has not made much headway in this country during recent years except in parts of East Anglia and Bedfordshire. In this area large numbers of ducks are fattened in the spring and early summer. The fatterer as a rule, with some exceptions in Bedfordshire, does not rear the birds himself but purchases supplies from smallholders. The ducklings produced on these farms are mostly

The Table Poultry Industry

of the Aylesbury type and realize quite good prices when sold. In May, 1931, American imported ducklings were quoted at 1s. 0½d. to 1s. 0¼d. per lb., whilst first quality English birds were quoted at 1s. 6½d. to 1s. 8d. per lb. The numbers of ducks kept in England and Wales in 1933 were only very slightly higher than the 1906 figures.

Channels of Distribution.—Supplies of table poultry reach the consumer through a variety of channels:—

(a) Poultry have been sold by auction in this country for many years, and there are probably over 400 markets in England and Wales in which poultry, either alive or dead or both, are sold by auction. This method of sale, however, is not very common in Wales, in the north of England, and in parts of the Midlands. In the south, fatteners obtain some of their supplies of lean chickens through auctions, but birds sent in in good condition often realize higher prices than fatteners can afford to pay. Poultry sold alive in auction marts are seldom graded and the price range is often a wide one.

(b) Country markets, where sales are carried through by private treaty with dealers, merchants or consumers. Sometimes in these markets producers display their goods on stalls in dressed form.

(c) National Mark packing stations or private fattening stations. The former are increasing in number but often find it difficult to obtain supplies of the quality required.

(d) Dealers or higglers, who collect from the farm for re-sale either to local shopkeepers, to wholesale buyers, or for consigning to a distant market. Some of these dealers undertake conditioning.

(e) Direct marketing to London central markets, such as Smithfield and Leadenhall.

(f) Direct sales to shops and stores.

(g) Direct sale to consumers, namely, private rounds or sales to hotels, etc. This method of sale is fairly common at seaside resorts.

(h) A chicken canning factory, which has been set up at Ightham in Kent, has opened a collecting depôt for chickens at Preston, in Lancashire. This Lancashire depôt is stated to collect during the season between 5,000 and 7,000 birds daily, but as the proportion of birds of the desired weights, namely 1½ lb. and 3½ lb. has been comparatively small, the balance is said to have been disposed of mainly in the open market, chiefly in Manchester, with the result that prices in that market have been depressed at times.

Where Home Supplies Fail, and Why.—The main defects of the home supply may be summarized as follows:—

Lack of finish or condition in the birds (this refers particularly to chickens and fowls).

Unsuitability of size and type.

Uneven supply during the year.

Unsuitable presentation.

The great bulk of English table poultry reaches the market in an unfinished condition. This is partly due to the low prices obtainable for surplus cockerels during the flush season. Some producers wish to get rid of these birds at almost any price so as to avoid the cost of keeping them, and many producers would not think it worth their while to go to additional expense in conditioning their birds when they find such difficulty in marketing their surplus at satisfactory prices. Often, however, unconditioned birds are sent

THE TABLE POULTRY INDUSTRY

to the market owing to lack of knowledge on the part of the producer, and, as in country markets little grading for sale takes place, there is no demonstration to the producer of the superior value of properly graded and conditioned birds. Practically all the "refuse" from poultry farms, unhealthy and badly-grown birds, and old fowls, which are difficult if not impossible to condition, come into the market and thus tend to depress prices.

Many of the chickens sent to market are kept too long and are therefore too big and coarse for market requirements. On the other hand, the type of bird marketed is often unsuitable. Breeds that produce large-framed chickens that do not carry much flesh while growing are not the type the market requires—at least until they have been properly fattened.

British chickens reach the market in irregular supply. As previously stated, the bulk is marketed from about June to December, whilst there is a shortage from about January to June. This irregularity of supply could be overcome if more poultry keepers hatched and reared chickens in the early autumn, and if supplies were taken off the market during the cheap period and cold-stored. There is no technical reason why British poultry should not be cold-stored successfully if correct technique be adopted. Cold storage, however, involves problems of finance as well as of technique, as risk of financial loss would have to be taken, since the market might be unfavourable when the birds finally reached the market.

The presentation of British poultry in the market leaves much to be desired. Properly graded and packed supplies are now reaching the market from National Mark packing stations and from some private packing centres, but these supplies are at present merely "a drop in the bucket." Even the old-established Sussex fatterer still sends his birds to London in the old Sussex ped, and the buyer coming into Smithfield turns these birds out of the ped and makes a selection of those suitable for his particular trade, whereas when he buys imported birds he may open and examine one case, but he frequently buys on description or reputation alone. Retail trade in poultry is passing into the hands of the multiple shops. Some of these, it is true, obtain their supplies direct from producers; but even so, there are few of these buyers who would not prefer to purchase properly graded and packed supplies in which they would have sufficient confidence to purchase on description alone. It must not be forgotten, of course, that whilst the countries overseas from which we draw our supplies are compelled to bulk and standardize in order to obtain a place in our markets, and that they keep their poor quality birds at home and send us only their best, we, on the other hand, have to find a market here for our poor quality produce as well as our best. At the same time, there can be no question that a far more general adoption of standardized methods of marketing is essential if much expansion of the British table poultry industry is to be secured.

Education and Research.—Although these defects in the industry are pointed out, it should be stated that considerable efforts have been made for a number of years past to improve and develop the British table poultry industry. For over 20 years efforts to educate producers in these matters have been made by our agricultural education authorities. These activities, it is true, have been limited by financial

THE TABLE POULTRY INDUSTRY

considerations. None the less, they have been and are being made, and progress would undoubtedly have been far less than it has been had it not been for the work of the County Poultry Instructors and of our Agricultural Education Institutions. Several counties might be quoted in which rapid development has taken place in table poultry production during the last five or six years, and this has largely been due to the activity of the County Poultry Instructor. These educational efforts, however, are always handicapped when prices fall, as they have fallen during the past year or so.

The production and marketing of table poultry occupies an important position in the curriculum at the National Institute of Poultry Husbandry and no student can now obtain his National Diploma in Poultry Husbandry without having gained a good knowledge of the subject.

For some ten years past, experimental work into the problems of table poultry production has been conducted under the National Poultry Institute Scheme at the South-Eastern Agricultural College, Wye, Kent, and much valuable information regarding suitable breeds and cross breeds, methods of feeding and costs of production, have been obtained through this work. Similar work is going on at the National Institute in Shropshire, and fundamental research into the problems of nutrition is being conducted at Cambridge, whilst an investigation into some of the problems of cold storage is being carried out at the Low Temperature Research Station at Cambridge.

As regards the production of birds of more suitable type for table purposes, many of the accredited breeding stations maintain special table breeds or crosses, and the Gloucestershire Agricultural Education Authority has recently accredited a large hatchery which is prepared to supply considerable numbers of day-old chicks suitable for rearing for table purposes. At Wye it is proposed to carry out a special investigation into the commercial possibilities of producing the 2½-lb. chicken for which buyers say there is such a large demand.

The national grades set up for table poultry under the Agricultural Produce (Grading and Marking) Act, and the development of the National Mark packing stations—of which about 30 have now been established—give a lead in standardized marketing. The difficulties encountered by these stations should in time be overcome. The producer can be educated, both directly and through price pressure, to produce the article required by the market. Recently, however, the price level has provided him with very little encouragement in this direction.

More investigational work on the economic side is necessary into the various methods of table poultry production. Something is being done at a few of our institutions and by County Education Authorities, but it is far too small in view of the numerous problems that require investigation. If imported supplies are to be completely replaced, there must not only be an alteration in the type and quality of the

THE TABLE POULTRY INDUSTRY

birds put on the market and in the method of their presentation and supply, but there must be an appreciable reduction in costs of production. At the present time, well-finished and standardized Russian chickens are available at 10d. per lb. wholesale, and when it is remembered that this price has to include a tariff of 3d. a lb., collection and transport charges from the interior of Russia, and the wholesale merchants' profits in London, it can be realized what a small price the producer must receive for this class of bird. Similar comments might be made regarding the supplies of Hungarian chickens. If birds of this class were altogether excluded, there is no certainty whether for some time to come the present purchasers would be prepared to accept British chickens, which under existing conditions could only be supplied at a higher price if the home producer were to be left any profit at all. Further, there may be some risk that if retailers, who to some extent depend at present upon foreign imports to maintain continuity of supply in their shops, were unable to maintain this continuity, they might be reluctant to continue selling poultry at all.

Tariffs.—The present position regarding tariffs is as follows:—

*Imports from foreign countries:—

(a)	Dead poultry—Fowls, ducks and geese ..	3d. per lb.
(b)	Turkeys	1d. per lb.
(c)	Other kinds	10 per cent. <i>ad valorem</i>
(d)	Live poultry	10 per cent. <i>ad valorem</i>

*As regards imports from the Irish Free State, the duties are now as follows:—

Poultry (dead)—

Fowls, ducks and geese	4d. per lb.
Turkeys	5d. per lb.
Other kinds	40 per cent. <i>ad valorem</i>
Poultry (alive)	40 per cent. <i>ad valorem</i>

This country departed from the gold standard in September, 1931, and tariffs were first imposed in March, 1932. Total imports of live and dead poultry into the United Kingdom in 1933 were about 30 per cent. less in quantity than in 1931, and the declared value declined from £3,319,662 in 1931 to £2,009,056 in 1933. It might be added that on December 4, 1933, a draft Order, made under the Merchandise Marks Act, 1926, was laid before Parliament, and when this Order comes into operation all dead poultry imported into the United Kingdom will be legibly and durably marked in a conspicuous manner with an indication of the origin of each bird. This Order applies to fowls, ducks, geese and turkeys, but not to guinea fowl.

Many of the problems awaiting solution in the table poultry industry are similar to those in the egg industry—the orderly supply of standardized and bulked quantities to the market, the co-relation of supply to demand, the securing for the producer of a fair reward for his labours, and for the consumer the regular supply of a good article at a reasonable price, etc. With table poultry, however, the problems of production and distribution differ considerably. In the main, the eggs produced in this country are of good quality, and, unless delayed and mishandled in transit, are suitable for market

THE TABLE POULTRY INDUSTRY

requirements. A large amount of the table poultry produced, however, is unsuitable for market requirements, and much educational work needs to be done before a general improvement in this respect is likely to be obtained. Table poultry are mainly a secondary and not a primary product like eggs, and many egg producers have in the past found difficulty in disposing of their table birds at a price that left them a profit. Poultry is not a regular article of diet in this country, and it seems expensive if compared with meat—especially with the cheaper qualities—and the edible flesh of the cooked bird is only about 30 per cent. or less of the carcass. It seems desirable, therefore, that every effort should be made to stimulate the consumption of British poultry, to improve the channels and methods of distribution, and if possible to reduce prices to the consumer.

INSTRUCTION IN CLEAN MILK PRODUCTION IN 1933

GREAT interest has been aroused amongst producers, distributors and consumers by the establishment of the Milk Marketing Board, with its wide powers of regulation and control in the buying and selling of milk, of which not the least important is the obligation to introduce, as soon as it is practicable to do so, a system of bonus payments for high-quality milk by means of a Register of Accredited Milk Producers. The main considerations that influenced the Reorganization Commission for Milk in the formulation of the proposals for the establishment of the Register were (1) that it is essential to the success of any marketing scheme to secure the confidence of the consumer in the quality of the produce, and (2) the desirability of ensuring that producers who incur extra expenditure and take considerable pains to produce milk of a high standard of cleanliness should receive a better price than those who are lax in their methods. That the Milk Marketing Board realizes and appreciates these considerations is evidenced by the fact that, within a few months of its establishment, it is already exploring the possibilities of forming the Register, a special sub-committee having been set up for this purpose.

The "Clean Milk" movement in this country has made great progress, particularly during the last ten years or so; but contracts based almost exclusively on quantity without regard to quality give no incentive to produce better milk, and have consequently proved the chief obstacle to the wider extension of the movement. It is true that, in some few instances, milk distributors have introduced schemes of bonus payments for better milk, but, taking the industry as a whole, the producer has not been encouraged to give of his best.

Despite this drawback, however, the County Education Authorities have made every effort to secure a general improvement in the standard of production, and the instructional schemes that they have organized have been remarkably successful. It is probable that producers who were enthusiastic enough to take steps to improve their standard of production by this means will have little difficulty in satisfying the requirements of the Milk Board in connexion with the Accredited Register.

TABLE 1.—CLEAN MILK COMPETITIONS, 1932-33.

[illegible]

INSTRUCTION IN CLEAN MILK PRODUCTION

Notts ...	17	398	151	97	107	18	14	498	160	87	174	83
Oxfordshire ...	...	—	—	—	—	7	3	159	28	15	25	108
Rutland ...	26†	836	161	117	97	19†	17	499	114	83	51	110
Salop ...	...	—	—	—	—	—	—	—	—	—	—	256
Somerset ...	...	—	—	—	—	—	—	—	—	—	—	20
Staffs ...	...	—	—	—	—	—	—	—	—	—	—	128
Suffolk, E. and W.	20	448	177	129	80	17	15	415	102	88	68	180
Surrey ...	66	2,130	454	328	250	72	19	2,364	457*	313*	250*	252
Sussex, E.	40	1,500	240	175	120	25	15	1,100	100*	34*	50*	183
" W.	...	...	...	...	...	...	...	...	...	...	...	108
Warwicks.	31	775	279	243	120	87	70	2,385	724	419	428	201
Wilts. ...	3†	160	21	11	12	5†	4	229	32	21	10	17
Worcs ...	23	474	207	165	138	15	11	297	130	94	66	4,572
Yorks ...	28	673	336	274	84	35	21	645	420	329	91	...
St Helens Borough	17	276	102	89	68	—§	—	—	—	—	—	...
Total England	590	16,396	4,922	3,585	2,497	620	436	16,348	4,778	3,216	2,371	...
Anglesey	14†	90	28	20	98	9†	7	75	18	14	63	69
Brecon and Radnor	...	—	—	—	—	—	—	—	—	—	—	35
Caernarvon	...	—	—	—	—	—	—	—	—	—	—	36
Cardigan	...	—	—	—	—	—	—	—	—	—	—	44
Carmarthen	...	—	—	—	—	—	—	—	—	—	—	33
Denbigh...	...	—	—	—	—	—	—	—	—	—	—	80
Flint ...	8	127	64	52	20	13	13	229	78	51	30	79
Glamorgan	70†	1,175	560	273	350	35	21	579	256	150	140	77
Merioneth	7	59	56	43	21	—	—	—	—	—	—	44
Montgomery	...	—	—	—	—	—	—	—	—	—	—	...
Pembroke	...	—	—	—	—	12†	—	72	51	26	50	18
Total Wales	99	1,451	708	388	489	69	41	955	403	241	283	76
Total England and Wales	689	17,847	5,630	3,973	2,986	689	477	17,303	5,181	3,457	2,654	5,162

* Figures incomplete as competition was still in progress when return was made.

† Clean Milk competition for Butter-makers.

‡ Probationary Section of County Register of Accredited Milk Producers.

§ A Clean Milk competition was organised by the Borough Health Department in 1932-33.

|| Two competitions were commenced during the period.

INSTRUCTION IN CLEAN MILK PRODUCTION

Clean Milk Competitions.—Full particulars relating to the clean milk competitions that commenced during the years ended March 31, 1932, and March 31, 1933, respectively, are given on pp. 48 and 49. They show that, in the latter year, there was an increase of two in the number of competitions held, and, while there was no increase in the total number of producers taking part, there were, in 1933, nearly 500 competitors who had never previously entered a competition. Since the inception of this scheme in 1920, nearly 300 competitions have been organized and more than 5,000 producers have received instruction by this means. As 70 to 80 per cent. of these competitors have reached proficiency standard, there are about 4,000 producers whose records in these competitions prove that they are capable of producing really good milk.

County Registers of Accredited Milk Producers.—Some of the producers referred to above have, for a number of years past, taken part in a scheme for the administration of County Registers of Accredited Milk Producers. This scheme, which is purely educational except in so far as it has been used by some distributors as a basis for bonus payments, must not be confused with the Register to be introduced by the Milk Board. It is open to all milk producers who have obtained a certificate of merit in a county clean milk competition (or reached a comparable standard of efficiency in the probation section of the Register, which is administered on similar lines to a competition), and provides for the examination of 12 milk samples per annum, including three "surprise" samples, with advisory visits as and when required. Each sample is expected to conform with the following standard: bacteriological count not exceeding 300,000 per c.c.; *B. coli* absent in $1\frac{1}{10}$ c.c. Failure to attain the standard on three consecutive occasions results in the suspension of the producer concerned until such time as three consecutive satisfactory samples have been submitted. Particulars relating to the schemes in operation during the year ended December 31, 1932, are given in Table II. In 1933, the scheme was in operation in 10 counties, but details of the results are not yet available.

Advisory Schemes.—Schemes involving the periodical examination of milk samples were organized during 1933 in Berkshire, Hertfordshire, Huntingdon, Middlesex and Oxford on behalf of licensed producers of "designated"

INSTRUCTION IN CLEAN MILK PRODUCTION

TABLE II.

County.	No. of Producers registered.	No. of milk samples examined.	Remarks.
Essex	29	292	
Hants	37	444	2 producers removed from Register. 15 suspended, of whom 13 were reinstated.
Middlesex	2	14	
Norfolk	20	176	9 producers suspended.
Salop	15	180	3 producers suspended.
Suffolk	34	293	3 producers suspended. 2 producers withdrew.
Warwickshire	15	175	
Wilts.	22	300	2 producers withdrew. 6 suspended, of whom 5 were reinstated.
Worcester	7	84	3 producers suspended, of whom 2 were reinstated.
	181	1,958	

milk and other producers who were ineligible to take part in the county clean milk competitions. The number of producers who took part in these schemes was 106; 670 samples were examined, of which 517 satisfied the bacteriological requirements for "designated" milk.

In Kesteven and Nottinghamshire, advisory schemes of a similar nature, but not confined to a particular class of producers, were commenced on January 1, 1933. The latter scheme was, however, confined to producers in the Newark district, of whom 51 took part. Up to the time when the return was made, 388 milk samples had been examined, of which 139 conformed with the bacteriological requirements for "designated" milk, and 85 advisory visits had been paid. In Kesteven, 5 producers are concerned and of the 12 samples so far examined, 7 were up to "designated" standard.

The following notes indicate the line of action taken by certain other County Authorities that do not organize clean milk competitions or similar advisory schemes:—

Cheshire.—Routine advisory work only is carried out in this county, but a considerable number of milk examinations were made at the Farm Institute during the year ended March 31, 1933. 266 samples from farmers or dairymen were examined, in addition to 307 samples examined owing to complaints as to quality.

Dorset.—A considerable amount of advisory work is carried out amongst the suppliers to three firms in the county who pay a bonus for cleanliness.

Staffordshire.—During the year ended March 31, 1933, the County Medical Officer of Health reported to the Farm Institute 329 samples of milk found to be unsatisfactory. In each instance the farmer con-

INSTRUCTION IN CLEAN MILK PRODUCTION

cerned was approached with an offer of assistance and advice, but only 110 accepted the offer. In each of these cases an advisory visit was paid and, where necessary, milk samples were taken for examination.

Hampshire.—In addition to the County Register of Accredited Milk Producers, a scheme for the examination of milk samples, embodying co-operation with 8 distributive firms and their 206 suppliers, was commenced on October 1, 1932. The analytical work is carried out in the County Medical Officer's Department, but the collection of samples from the milk depots and the advisory work in connexion with the suppliers is undertaken by the Agricultural Educational Staff. During the period ended March 31, 1933, 709 samples had been examined.

Milkers' Competitions.—A comparative statement of the number of milkers' competitions organized in 1932 and 1933 is given below:—

MILKERS' COMPETITIONS, 1931-33

County.	Year ended Mar. 31, 1932			Year ended Mar. 31, 1933.		
	No. of Competitions.	No. of Competitors.	No. who reached proficiency standard.	No. of Competitions.	No. of Competitors.	No. who reached proficiency standard.
Beds	2	39	33	1	14	13
Berks	18	76	75	3	22	22
Bucks	3	43	40	3	35	29
Cambs.	1	15	12	—	—	—
Cheshire	1	29	29	—	—	—
Cornwall	13	217	186	4	52	42
Dorset	—	—	—	1	8	8
Essex	1	64	52	—	—	—
Glos	—	—	—	2	16	13
Hants	2	75	55	1	77	67
Herts	4	68	54	2	42	36
Hunts	—	—	—	1	10	5
Isle of Wight	11	70	52	9	58	37
Kent	—	—	—	1	38	20
Lancs	1	24	17	—	—	—
Leics	3	21	14	—	—	—
Norfolk	1	85	69	1	99	80
N'humberland	—	—	—	1	30	15
Notts	1	14	11	—	—	—
Oxfordshire ...	1	77	60	1	75	53
Rutland	—	—	—	1	9	9
Salop	6	51	44	9	60	48
Suffolk, E. & W.	—	—	—	1	46	33
Surrey	2	68	56	2	48	40
Sussex, W. ...	2	27	27	1	10	10
Warwicks. ...	1	59	58	1	67	66
Wilts.	3	34	34	1	10	10
Flint	1	19	17	—	—	—
Glamorgan ...	—	—	—	3	24	9
Monmouth ...	5	71	66	5	73	67
Pembroke ...	4	58	40	4	67	40
	87	1,304	1,101	59	990	772

MARKETING NOTES

Eggs.—The poultry industry in this country has been expanding in recent years and there is no sign that the process is slowing down. During 1932 and 1933, the increased output of eggs in the United Kingdom was counterbalanced by a decline in supplies from abroad. Imports in the six months March to August last year were 10 per cent. less than in the corresponding period in 1932, and 29 per cent. less than in the same months in 1931. This diminution in imported supplies was not sufficient to maintain prices at their earlier level, but did at any rate minimize the decline.

During *the past three months*, however, the situation has changed and imports have been at a materially higher level than a year earlier; the increases in December and January were of the order of over 10 per cent. and last month (February) no less than 36 per cent. Inevitably, this has been reflected in prices. The average price of English eggs at the beginning of this month was only 10 $\frac{3}{4}$ d. per dozen compared with 12 $\frac{1}{4}$ d. at the same time last year, a fall of 12 per cent., and imported eggs show a corresponding decline.

As stated in the December, 1933, issue of this JOURNAL (page 859), the Ministers concerned with agriculture in the United Kingdom invited the Market Supply Committee to consider the situation in the egg market, and to advise upon the question of the quantitative regulation of imported supplies. Following the receipt of the Committee's Report, an announcement was made by the Minister in the House of Commons on March 15, in reply to a question by Lt.-Col. Acland-Troyte, the Member for Tiverton. The statement was as follows:—

“ I am aware of the low prices at present ruling in the egg market. As my hon. and gallant Friend will be aware, the question whether the existing Customs duties on foreign eggs should be supplemented by a measure of supply regulation has been the subject of careful consideration by the Market Supply Committee. In the light of the Committee's recommendation and having regard to all the circumstances, the Government do not propose to embark on any long-term plan for dealing with the

MARKETING NOTES

supply situation at this stage, particularly as a Reorganization Commission has that question before it. In view, however, of the rapid expansion of the home industry, the situation would be gravely prejudiced if the recent marked increases in imports were to continue. In order, therefore, to hold the situation for the time being, the Governments of the exporting countries concerned are being asked in the general interest to make every effort to ensure that their exports to this market during the period beginning to-day and ending on September 14 next, do not exceed the figures of the corresponding period last year. The Government have every hope of securing a favourable response.

Potato Marketing Scheme.—The Potato Marketing Board have announced that they have decided to suspend for the time being the operation of paragraph 67 of the scheme, which prohibits the sale by any registered producers, from September 1 in any year to July 31 in the following year, of potatoes for human consumption (other than new potatoes) which are capable of passing through a 1½-in. riddle.

No levy on producers will be made in respect of their 1933 potato acreage or production. This, the Board state, means that they will not make any levy on producers before September of this year, and then it will be on the 1934 acreage. This decision has no bearing on the producers' basic average. Producers are reminded that if they intend to plant in 1934 a higher acreage than their basic acreage, they must notify the Board of their intention before planting.

The Board are conducting a census of stocks of ware potatoes still on farms.

The offices of the Board are now at Africa House, Kingsway, London, W.C.2.

Milk Marketing Scheme—Summer Milk Prices.—The contract prices fixed for the sale of milk for the summer months, April to September inclusive, are as follows:—

(a) *Liquid Milk.*

*Price per gallon.

	April	May	June	July	Aug.	Sept.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
S.E. Region ...	1 1	1 0½	1 0	1 1	1 1	1 1
Other Regions	1 0	1 0½	1 0	1 0	1 0	1 0

* The extra ½d. in May is the distributors' contribution in respect of the proposed joint publicity campaign of the Board and the distributors.

MARKETING NOTES

The following allowances are in respect of Transit Risk:—

- (i) On Milk delivered to a Depot and subsequently sold in the S.E. Region $\frac{1}{2}d.$ per gal. less
- (ii) On Milk delivered to a Depot and subsequently sold in a region other than the S.E. Region $1d.$ per gal. less

Where any milk is produced in one region and sold in another the price payable for such milk shall be the price appropriate to the region in which it is produced or in which it is sold, whichever is the higher.

In addition to the above regional prices, the producer may qualify for an additional $\frac{1}{2}d.$ per gallon in respect of a level delivery with an allowance of 10 per cent. variation each way, and for premiums in respect of other special services.

(b) *Manufacturing Milk.*

- (i) Milk manufactured into butter or cheese. The price per gallon to be the average price per lb. for the previous month of Finest White Canadian Cheese and Finest White New Zealand Cheese, less a sum of $1\frac{1}{2}d.$
- (ii) Milk manufactured into condensed milk for export As in (i)
- (iii) Milk manufactured into condensed milk 6d. per gallon
- (iv) " " " " milk powder $4\frac{1}{2}d.$ " "
- (v) " " " " fresh cream $7\frac{1}{2}d.$ " "
- (vi) " " " " tinned cream 5d. " "
- (vii) " " " " chocolate 8d. " "
- (viii) Sterilized milk for export 6d. " "
- (ix) Milk manufactured into other milk products 9d. " "

Operation of the Scheme.—The regional pool prices and rates of producer-retailers' contributions for the five months October-February, 1933-34, are given below:—

Region.	Regional Pool Price.					Producer-Retailers' Contribution.				
	Oct. 1933	Nov. 1933	Dec. 1933	Jan. 1934	Feb. 1934	Oct. 1933	Nov. 1933	Dec. 1933	Jan. 1934	Feb. 1934
Northern	13 $\frac{1}{2}$	14	14 $\frac{1}{2}$	14	13 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$	2 $\frac{1}{8}$
North-western	13 $\frac{1}{2}$	14	14	13 $\frac{1}{2}$	13 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$	2 $\frac{1}{8}$
Eastern	14	14 $\frac{1}{2}$	14 $\frac{1}{2}$	14 $\frac{1}{2}$	14 $\frac{1}{2}$	1	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1
East Midland	13 $\frac{1}{2}$	14 $\frac{1}{2}$	14 $\frac{1}{2}$	14	14	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$
West Midland	12 $\frac{1}{2}$	13	14	13 $\frac{1}{2}$	13	1 $\frac{1}{8}$	2 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$	2 $\frac{1}{8}$
North Wales	13 $\frac{1}{2}$	13 $\frac{1}{2}$	14	13 $\frac{1}{2}$	13 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$
South Wales	13 $\frac{1}{2}$	13	14	13 $\frac{1}{2}$	13 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$
Southern	14	14 $\frac{1}{2}$	14 $\frac{1}{2}$	14 $\frac{1}{2}$	14 $\frac{1}{2}$	1	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$
Mid-western	12 $\frac{1}{2}$	13	14 $\frac{1}{2}$	13 $\frac{1}{2}$	13	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$
Far-western	13 $\frac{1}{2}$	13	13 $\frac{1}{2}$	13 $\frac{1}{2}$	13	1 $\frac{1}{8}$	2 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$	2 $\frac{1}{8}$
South-eastern	14 $\frac{1}{2}$	14	15 $\frac{1}{2}$	15 $\frac{1}{2}$	14 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$

Unweighted

Average	13.55	13.95	14.32	13.98	13.61	1.41	1.78	1.58	1.84	2.04
---------	-------	-------	-------	-------	-------	------	------	------	------	------

Contract prices for milk in February were the same in all regions, viz., 1s. 4d. per gallon. The inter-regional compensation levy was continued at the rate of 1d. per gallon on all liquid milk sales, and 85 per cent. of the proceeds were again distributed among the regions in proportion to their sales of manufacturing milk. The levy for

MARKETING NOTES

the Board's expenses, including the provision of reserves, was at the rate of $\frac{1}{4}d.$ per gallon on all sales of contract milk. Of the total contract milk sold in February, approximately 22 per cent. passed into manufacture, compared with 21 per cent. in January.

The price for manufacturing milk made into butter or cheese, and also condensed milk for export, was $3\frac{1}{4}d.$ per gallon during March; for the month of March, the prices for milk manufactured into fresh cream and tinned cream were fixed by the "Appointed Persons" at $7\frac{1}{2}d.$ and $5d.$ per gallon respectively.

A Press Notice issued by the Milk Marketing Board on February 8 indicated that the expenses levy of $\frac{1}{4}d.$ per gallon charged in October, 1933, covered all the expenses in connexion with the formulation, submission and inauguration of the Scheme, as well as the administration of the Scheme up to the end of December last. The sums accruing from the subsequent levies in November and December have been placed to reserve.

Three-quarters of the difference between the regional contract price for liquid milk and the regional pool price is accounted for by the equalization resulting from the pooling of the proceeds of liquid milk sales and of milk going into manufacture.

The Milk Marketing Board has intimated that Banks, on request, will notify milk producers of payments credited to their accounts. Producers are urged to make use of this offer.

Regional Marketing Offices have now been established in the following centres:—

<i>Region.</i>	<i>Centre.</i>
Northern ..	Newcastle-upon-Tyne
North-western	Manchester
Eastern ..	Cambridge
East Midland	Birmingham
West Midland	Worcester
North Wales	Wrexham
South Wales	Swansea
Southern	Reading
Mid-western	Yeovil
Far-western	Plymouth
South-eastern	Thames House, Millbank, London, S.W.1

Farm Cheese-makers.—Following on the Government's recent announcement of milk policy, the Board has made provision for farm cheese-makers in respect of the next six months, April to September inclusive. The arrangements will apply to farm cheese-makers who keep not less than

MARKETING NOTES

12 milch cows. In effect, the Board will pay to farm cheese-makers, in respect of each gallon of milk made into cheese on farms, the amount of the Government's advance *plus* 1d. per gallon in the case of "hard" cheese, and $\frac{1}{2}$ d. per gallon in the case of Caerphilly cheese. For purposes of calculation, 1 gallon of milk will be taken to be the equivalent of 1 lb. of cheese.

Pigs and Bacon Marketing Schemes.—*Contracts for Period, March-Dec., 1934.*—The closing date for registration of contracts for the period, March 1-Dec. 31, 1934, was March 12. In respect of this period, contracts have been signed covering 1,317,259 pigs. Of these, group contracts cover 248,692 pigs and direct contracts cover 1,068,567 pigs. In addition, it is estimated that curers will handle 63,288 pigs of their own production.

The bacon equivalent of pigs contracted for and of "curers' pigs" is estimated to be 1,701,030 cwt.

The rate of supply is thus a little below that for the period Nov., 1933—Feb., 1934. The deficiency occurs in the early months of the period when bacon pigs are normally somewhat scarce. In the autumn, the monthly rate of contracting represents an increase of about 12 per cent. over the corresponding period last year.

Transport Arrangements.—The Standing Committee of representatives of the Pigs and Bacon Marketing Boards and the Railway Companies, appointed to consider applications from feeders and curers for exemption from the agreed flat rate arrangements for transportation of bacon pigs, has laid down the general grounds on which such exemptions will be authorized. These grounds are summarized below. They apply to distances of between 5 and 15 miles from the curers' factories. All exemptions are subject to individual cases being approved after full details have been submitted to the Committee.

(1) For transport vehicles at present actually owned by curers or pig producers, provided that such vehicles are not used for conveyance of pigs other than the property of the curer or pig producer, as the case may be.

(2) Where curers have already made forward haulage contracts, provided that the contracts are not renewed upon expiry.

(3) Where the time taken in transit by rail is unreasonable compared with road haulage. The fullest possible information of such cases must be given.

(4) For hired transport, until such time as the Railway Companies are able to make suitable arrangements.

(5) In cases where Railway Companies have no loading facilities for pigs.

MARKETING NOTES

It has also been agreed that, pending the Committee's decisions on the applications for exemption which are submitted, the curers may carry on their existing transport arrangements provided applications for exemption, where required, have been submitted in the proper manner.

Contract Defaults.—The Pigs Marketing Board has investigated a number of instances where deliveries have not been up to contract, and, where there is evidence of deliberate default, is taking steps to recover the damages provided for in the contract.

In one instance judgment has been obtained against a producer for damages of £125 and costs.

Results of Pig Grading.—The following table shows the results of the grading of pigs under contract during November, December and January:—

		November	December*	January†
		%	%	%
Grade A	.. .. .	4.9	5.2	8.4
„ B	.. .. .	20.1	22.1	25.4
„ C	.. .. .	18.8	20.0	19.8
„ D	.. .. .	33.2	31.0	27.2
„ E	.. .. .	3.2	2.6	2.5
Other pigs —				
Class 4 pigs (ungraded)†	..	4.5	5.2	3.7
Ungraded, but accepted by curers		7.8	8.3	8.6
Rejected	.. .. .	7.5	5.6	4.4

* Grading results for December differ slightly from those given in the *March Journal*, Vol. XL, No. 12, when returns were incomplete.

† Provisional figures.

‡ No class 4 pigs are graded and, in addition, a number of pigs of poor quality or of wrong weights have been accepted by curers.

Grading results show a continued improvement, the percentage of pigs delivered which fell in the lowest two grades being 29.7 in January compared with 33.6 and 36.4 in December and November respectively, while the percentage of all pigs in the top three grades rose from 43.8 and 47.3 in November and December respectively to 53.6 in January. The percentage of rejected pigs has fallen from 7.5 per cent. in November to 4.4 per cent. in January.

Home-produced Sugar.—Statement of Policy.—In July, 1933, the Minister announced in the House of Commons the decision of the Government to introduce, as a temporary measure, legislation providing for a continuation of the subsidy on home-grown sugar (with a modification as to molasses) for the period of another campaign after the expiry of the present subsidy Act in September, 1934. This decision was based upon the understanding that the refining and beet-sugar manufacturing interests would

MARKETING NOTES

co-operate in submitting a marketing scheme under the Agricultural Marketing Acts, 1931 and 1933, and that they would be prepared to co-operate in due course with growers of sugar-beet in the promotion of a development scheme under which the operations of sugar manufacture, refining and processing may be rationalized in the interests of greater productive efficiency. The Minister also confirmed the intention of the Government to appoint an impartial committee to make recommendations for the future conduct of the sugar industry.

Sugar Marketing Scheme.—The beet-sugar and refining interests have prepared and submitted to the Minister and the Secretary of State for Scotland a scheme under the Agricultural Marketing Acts for regulating the marketing of sugar produced in Great Britain. Notice of the submission of the scheme was published in the London and Edinburgh *Gazettes* on February 9, 1934, and the period within which objections or representations could be made with respect to the scheme expired on March 24. A Public Inquiry into objections will probably be held early in May.

Sugar-Beet Marketing Scheme.—The preparation of a scheme by beet growers to regulate the marketing of their product has reached an advanced stage, and it is expected that the scheme will shortly be submitted to the Ministers concerned.

The British Sugar (Subsidy) Bill.—The progress made by the industry in the preparation of marketing schemes enabled the Government to proceed with its plans with regard to legislation and the appointment of an impartial committee to make recommendations of a long-term character.

The British Sugar (Subsidy) Bill was introduced in the House of Commons on March 7 and received a Second Reading on March 19. The Bill extends the period within which a subsidy on home-grown sugar may be payable until August 31, 1935. It provides that the subsidy on sugar shall be continued at the present rate of 6s. 6d. per cwt., and, as regards molasses, that subsidy at the present rate, equivalent to 9d. per cwt. of sugar, shall be payable if the average world price of raw sugar (96° polarization) during the last quarter of the year 1934 does not exceed 5s. 6d. per cwt. If the average price of raw sugar exceeds 5s. 6d. but is less than 6s. per cwt., the molasses subsidy

MARKETING NOTES

will be reduced by (in round figures) $1\frac{1}{2}d.$ per cwt. for each rise of a penny in the price of raw sugar. When the raw sugar price is 6s. or more, no subsidy on molasses will be payable.

Committee of Inquiry.—In moving the financial resolution in the House of Commons, on March 6, before the introduction of the Bill, the Minister announced that the Government had decided to limit the personnel of the committee of inquiry to three. Mr. Wilfred Greene, K.C., would be the Chairman, and the names of the two other members would be announced shortly. The terms of reference are as follows:—

“To inquire into the condition of the sugar industry in the United Kingdom, including both home-grown beet sugar and imported sugar, and covering production, refining and distribution, and, having in mind the changes in the structure of the industry which would follow upon its reorganization under the Agricultural Marketing Acts, to make recommendations for its future conduct, and, in particular, as to the application of State aid in so far as this may be considered necessary.”

International Sugar Discussions.—The serious position of the sugar industry of the world (both cane and beet), which has arisen through the catastrophic fall in prices, engaged attention at the Monetary and Economic Conference held in London last summer. Proposals for the limitation of sugar production which were considered at this Conference were followed up by the International Sugar Council. Subsequently, the Bureau of the Conference, at the request of the Sugar Council, convened a preliminary meeting to which His Majesty's Government, the Government of the U.S.A. and the governments of the countries that are parties to the Chadbourne Agreement, namely, Belgium, Cuba, Czecho-Slovakia, Germany, Hungary, the Netherlands, Peru, Poland, and Yugo-Slavia, were invited to send representatives. The object of this preliminary Conference was to resume the examination of the sugar question on the lines initiated at the Monetary and Economic Conference, and to ascertain whether the convening of a subsequent meeting of wider scope, to which the principal importing and exporting countries concerned would be invited, would be likely to lead to the conclusion of a general agreement for ensuring a better organization of the world production and marketing of sugar.

This meeting was held in London during March 5-10, under the Chairmanship of Lord Plymouth, the Parlia-

MARKETING NOTES

mentary Under-Secretary for the Colonies, and was attended by government representatives of all the countries invited, except Germany.

At this Conference, the United Kingdom representatives reaffirmed the adherence of His Majesty's Government to the proposals made previously (subject to a small adjustment of the figures relating to the Colonies) namely, that the Government was prepared, in principle, to agree to limit the amount of home-grown sugar to be assisted by direct Exchequer subsidy, subject to due allowance being made for the increasing efficiency of the industry; and as regards non-self-governing Colonies, to stabilize exports for two years at the present level of 850,000 tons and for the next ensuing three years at maxima of 878,000, 914,000 and 950,000 tons respectively.

The prospects of an agreement were fully discussed in relation to a re-allocation of export quotas among the countries participating in the Chadbourne Agreement, and to the plan, now before the United States Congress, for regulating supplies in the U.S. market. The Conference came to the conclusion that there did not appear to be sufficient justification for calling together, at the present time, representatives of all the countries interested in the production and marketing of sugar. The Bureau of the Monetary and Economic Conference was urged to continue to hold its watching brief and the International Sugar Council was asked to pursue any further negotiations that promised agreement among the countries who are parties to the Chadbourne Agreement.

Progress of the Home-grown Sugar Industry in 1933.—The area under the beet crop in 1933 was 366,000 acres, the highest recorded in this country. The yield, 9 tons to the acre, was also a record and compared with an average yield of $8\frac{1}{4}$ tons for previous years. The quantity of washed and topped beets delivered to the factories in 1933 was 3,306,000 tons as against 2,232,000 tons in 1932 and 3,060,000 tons in 1930. On the other hand, the sugar-content was unusually low, the average for the year being 16.3 per cent., only slightly better than the lowest recorded, namely, 16.1 per cent. in 1927.

Weather conditions during the early stages of cultivation were generally ideal, and the crop made an excellent start. The prolonged drought that commenced in July, however,

MARKETING NOTES

retarded root development, particularly on the lighter soils, but the summer was favourable to sugar assimilation. Early liftings, which were frequently rendered difficult by lack of rain and hardness of the ground, gave indication of a high sugar-content and a low yield, but heavy rains in late September and early October, followed by mild conditions throughout the remainder of the lifting period, caused the roots to grow considerably: this brought about a decrease in sugar-content but a heavy increase in yield. The weather generally remained favourable for lifting operations, and the dirt tare at 11.1 lb. per cwt. was the lowest yet recorded in this country.

Owing to the heavy deliveries of beet, the manufacturing campaign was prolonged until the middle of February. The quantity of sugar produced, namely 463,000 tons (247,000 tons refined and 216,000 tons raw) was the largest campaign output of the subsidy decade.

The extraction of sugar expressed as a percentage of the weight of beets delivered was 13.9. The sugar recovered from the beets in the factory process was 97 per cent. of the total quantity of sugar available.

The output of molasses was about 127,000 tons. The quantity of dried pulp produced was 245,000 tons, comprising 71,000 tons of plain and 174,000 tons molassed. The production of wet pulp was 77,000 tons.

The vote of £2,900,000 for the service of the Sugar Subsidy in the Financial Year 1933, proved insufficient to meet requirements, and on March 5 the House of Commons approved a supplementary vote of £450,000.

Sugar-Beet Crop, 1934.—Reports received indicate that the majority of the factories have contracted up to requirements. It is expected that the 1933 acreage will be exceeded.

Wheat Act, 1932.—*Sales of Home-grown Wheat.*—Certificates of wheat sales lodged with the Wheat Commission from the commencement of the cereal year on August 1 last up to and including March 10, 1934, covered 20,956,000 cwt. of millable wheat compared with 14,670,000 cwt. for the corresponding period last year.

The Fat Stock Direct Consignment Schemes.—Reference was recently made in the JOURNAL to the definition of a "Super" grade for bullocks and heifers

MARKETING NOTES

consigned to National Mark beef centres for sale on the basis of grade and dead weight.

The first consignment to provide carcasses of the "Super" grade was recently received at Birmingham from the Dinam Estates Company, Llandinam, Montgomeryshire. Ten animals in all were consigned, of which two were graded "Super" and eight "Grade I" or "Select." The total live weight of the animals was 92 cwt. 2 qr. 16 lb., and the carcass weights were 1,163 lb. for the two "Super" carcasses, and 4,895 lb. for the eight "Grade I" or "Select" carcasses. On the average the animals killed out at 65.4 lb. to the cwt. or 58.4 per cent. The amount realized was £203 2s. 11d., from which the only deduction made was the sum of 10s. in respect of insurance.

National Mark Vegetables.—The range of home-grown vegetables brought within the scope of the National Mark movement will shortly be extended by the inclusion of Horseradish, Cultivated Mushrooms and Ripe Onions and Shallots.

Horseradish.—One grade only, viz., "Selected," is provided for horseradish. Each root packed must be not less than $\frac{3}{4}$ in. in minimum diameter, not less than 8 in. in length, and of good colour and condition. The horseradish will be tied in bundles of 12 or half-bundles of 6 roots, and will normally be packed in non-returnable wooden barrels (which must be securely lidded). The count of bundles or half-bundles in the container must be declared on the National Mark label.

Authority to apply the Mark will be granted to (1) growers with a minimum area of $\frac{1}{4}$ acre devoted to the cultivation of horseradish, (2) merchant packers packing at least 5 tons in a year, and (3) approved associations of growers.

Mushrooms.—The scheme provides for four grades, viz., "Selected Buttons," "Selected Cups," "Selected Cups (Large)," and "Selected Flats," and also defines for each grade the stage of maturity, length of stem, colour and condition at the time of packing. The diameter of the cap for "Selected Buttons" will be between 1 in. and $1\frac{1}{4}$ in., for "Selected Cups" between $1\frac{1}{4}$ in. and $2\frac{1}{4}$ in., for "Selected Cups (Large)" between $2\frac{1}{4}$ in. and $3\frac{1}{4}$ in., and for "Selected Flats" between 1 in. and $4\frac{1}{4}$ in.

All grades of mushrooms will normally be packed in orderly layers, stem up, in the No. 4 standard mushroom chip or the No. 6 taper chip baskets. The No. 12 taper chip basket may also be used for packing mushrooms of the "Selected Flats" grade only.

The containers may be lined with paper but must be securely lidded. The National Mark labels must bear a declaration of the net weight (in lb.) of the contents at the time of packing and a declaration of the colour of the mushrooms, as either white, creamy white, or brown. The contents of the container of the "Selected Flats" grade must be described on the label as being in one of the following categories:—"Small" where the average size of the mushrooms is between 1 in. and 2 in. in diameter, "Medium" where the average size is between 2 in. and 3 in. in diameter, and

MARKETING NOTES

"Large" where the average size is between 3 in. and 4½ in. in diameter.

Authority to apply the Mark will be confined, in the first instance, to (1) growers or packers with an estimated annual output of not less than 3,000 lb. or who produce mushrooms on not less than 2,000 square feet of beds, and (2) associations of growers.

The application of the National Mark will be restricted to edible mushrooms of the genus *Psalliota*, grown under controlled conditions of cultivation, e.g., under cover (glass, shade or otherwise), and in open manured beds other than grass land.

Ripe Onions and Shallots.—The three grades proposed for ripe onions packed under the National Mark are "Selected Picklers," "Selected Medium" and "Selected," whilst one grade only, viz., "Selected," is provided for shallots.

For the various grades the following size requirements are prescribed:—

<i>Grade.</i>	<i>Width at greatest transverse diameter.</i>
"Selected Picklers"	Not more than 1½ in.
"Selected Medium"	Not less than 1½ in. and not more than 1¾ in.
"Selected"	Not less than 1¾ in.
"Selected Shallots"	Not more than 1¼ in.

The scheme also defines a standard of colour and condition, and provides for the use of non-returnable loosely woven bags, capable of holding 56 lb. or 112 lb. The weight must be declared on the National Mark labels, which should also bear, in the case of the "Selected Pickler" grade, a declaration that the onions are in one of the following categories, viz., "A" where the average diameter of the onions is below 1½ in., or "B" where the average diameter of the onions is from 1½ in. to 1¾ in.

Authority to apply the Mark will be granted to (1) growers with a minimum area devoted to the cultivation of onions and shallots of at least ½ acre, (2) merchant packers packing 50 tons in a year, and (3) approved associations of growers.

Copies of the provisional leaflets describing the schemes may be had on application to the Ministry.

Marketing Demonstrations.—At the Royal Horticultural Society's Spring Show, to be held at Vincent Square, London, S.W.1, on April 17-18, the Ministry will arrange a comprehensive demonstration of all the National Mark schemes for vegetables, covering those to be introduced in the near future as well as those already in operation.

Besides specimens of packs and grades, working demonstrations of grading and packing will be given. Arrangements have been made for the winner of the Broccoli Packing Class at the Western Commercial Spring Show, held at Penzance on March 15-16, to demonstrate the trimming and packing of broccoli in accordance with National Mark standards. The grading of ripe onions with a new type of machine will be shown, and also the making of non-returnable wood crates and boxes by hand and by machinery. The grading of tomatoes with a "Helix" grader will be demonstrated.

With the object of making the aims and operations of the Marketing Schemes more fully appreciated by producers and the general public, arrangements have been made for the Milk, Pigs, Bacon, and Potato Marketing Boards to stage exhibits in the Ministry's pavilion at a number of

MARKETING NOTES

the leading agricultural shows during the forthcoming season. The rest of the stand will be devoted to demonstrations of the National Mark schemes. A cinema will be included for showing National Mark and other films. A full list of the shows to be visited by the Ministry with those at which the Marketing Boards will participate will be issued shortly.

Displays of National Mark Produce.—A striking display of National Mark produce of England and Wales was organized by the Ministry at the South London Exhibition, Crystal Palace, which was opened by the Prime Minister on March 7. The Ministry will also have a stand for the same purpose at the Manchester Grocers' Exhibition to be held at Belle Vue, Manchester, April 7-17. A working egg-grading demonstration will be included on the stand at this Exhibition.

Publicity for National Mark Products.—A National Mark shopping fortnight will be held in Bexhill-on-Sea from May 14-26. Local arrangements are being made by an influential Committee under the chairmanship of Earl De La Warr, who is Mayor of Bexhill as well as Parliamentary Secretary to the Ministry. The Ministry will stage a special display of National Mark products in suitable premises in the town. Amongst other activities that are being arranged are a shop-window-dressing competition, which will be judged by means of a popular ballot of the townspeople, and film displays on National Mark subjects for housewives and senior schoolchildren.

Publicity for Home-grown Plants and Flowers.—On the joint invitation of the London and North Eastern Railway and the Spalding and District Bulb Growers' Association, acting in co-operation with the Flowers and Plants Publicity Committee of the Ministry, thirty representatives of the leading London and provincial newspapers and of the horticultural trade Press visited Spalding on February 26, to view a fine display of early tulips and daffodils in flower in the nurseries. At each nursery visited, a tour was made of the glasshouses and packing sheds under the personal guidance of the owners, and the workings of the industry were explained in detail. As a result of this visit many London and provincial newspapers

MARKETING NOTES

published articles and photographs dealing with the striking development of the home bulb-growing industry in recent years.

This visit was a prelude to a special half-day excursion that will be run to Spalding by the London and North Eastern Railway on Thursday, May 10, to enable the public to visit the bulb fields when the tulips are in flower. The arrangements are being made by the Ministry in co-operation with the railway company and a special Sub-Committee of the Spalding and District Bulb Growers' Association.

The Inner Circle Gardens, Regent's Park, London, are being transformed into a centre for the display, in natural surroundings, of British-grown plants and shrubs. With the co-operation of H.M. Office of Works and the Horticultural Trades' Association, a new shrub garden is being laid down on an attractive site near the recently established British rose garden. The shrubs have been contributed from the nurseries of growers in different parts of the country, and the work of planting has already started. As soon as the work is completed, the Press will be invited to inspect the gardens.

Organized Egg Marketing in Germany.—In pursuance of the Decree for the organization of the egg market in Germany, referred to in the March issue of this JOURNAL,* regulations have been issued providing for the reorganization of the marketing of German eggs.

For the purposes of the new system, the country is divided into fifteen districts, in each of which a District Commissioner is to be responsible, under a Reich Commissioner, for the collection and disposal of the local output of eggs. In each district local collecting stations are to be established, to which producers, unless conditionally exempted as producer-packers, are required to send all eggs not required for consumption in their own households or for sale direct to consumers. As far as possible, existing co-operative societies are to be used as collecting stations; in other instances, independent buyers of eggs are to be given preference for appointment as managers provided that they give up trading on their own account.

The collecting stations must dispatch all their supplies to packing stations, the main functions of which will be to grade and mark eggs in accordance with the provisions of the Egg Decree.† With the exception of such quantities as they are able to sell direct to consumers, the packing stations must, in turn, place the eggs supplied to them at the disposal of central district offices. These offices will undertake the sale of eggs within their districts in

* Vol. XLI, No. 12, p. 1181.

† See this JOURNAL, Vol. XXXIX, No. 4, July, 1932, pp. 367-71.

MARKETING NOTES

accordance with the instructions of the District Commissioners. For this purpose they will, in general, utilize the services of the wholesale trade.

All supplies that cannot be disposed of in their area by the district offices must be consigned to or on the instructions of a Central Sales Office. Alternatively, if there is a deficiency of supplies in any district, additional supplies must be obtained through the Central Sales Office. The primary functions of the Central Sales Office will be to effect an adjustment between the districts in which there is a surplus of supplies and those in which there is a shortage, and to arrange, in conjunction with the Reich Egg Office, for the holding of stocks.

The regulations also provide for a measure of horizontal organization. This is to be effected by the local grouping of collecting and packing stations into supply associations, based, presumably, on the packing station as the central nucleus. The District Commissioners are empowered to appoint Sub-commissioners for each supply association. The supply associations are in turn to be combined in a marketing federation for each district. The main purpose of this horizontal organization is to ensure the uniform execution of the instructions issued by the District Commissioners.

Finally, the District Commissioners are given authority to control prices and price margins, subject to the approval of the Reich Commissioner. They are to fix the prices at which collecting and packing stations are to settle accounts with producers, the prices paid by the district offices to packing stations as well as the prices at which the district offices may sell to the trade, and they are to ensure that the prices and price margins so fixed are maintained. Contravention of the regulations is punishable by monetary fine, subject to the right of appeal to an arbitration court, the ruling of which is final.

APRIL ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington.

THE weather differences between April and March are largely a matter of season. The records confirm the traditionally showery character of the month, though the total quantity of rain is normally small. April is in reality a comparatively dry month in the Eastern Midlands. Although the days continue to lengthen there is no marked increase in bright sunshine in comparison with March. It is, however, the first month of definite growth, which is reflected on all sides and particularly in the early development of spring-sown cereals and of grass. Ground frosts that often take their full toll of March growth are more rare in April, though one cannot place too much reliance on the natural food supplies that become available from this early growth. It is a common experience that, for the stock farmer, this is often one of the most difficult months in the farming year. Food supplies that have been stored for the winter requirements are now usually becoming very depleted, while there is always some hesitation as to the wisdom of making too early use of the first growth of grass. It will usually be found advisable to allow pastures to make a sound grass growth before keeping the grazing in check. This means that it is not always in the best interests of either stock or land to be in a hurry to change from winter to summer conditions. If the prices that are fixed for milk in the various months of the year are chiefly based on feeding and labour costs, then it is not always easy to understand why lower prices rule in March than for the previous winter months, and why April should be included in the summer category. Other factors intervene as well as feeding costs, however, and particularly the tendency for cows to calve down in spring and early summer, thereby partly accounting for price depressions in the values of dairy cows.

The difficulties this month are probably greatest under mixed farming conditions, particularly where there are ewes and lambs that make full use of grass growth as it occurs. It is this fact that often causes the dairy farmer to regard sheep with some suspicion, especially if the stocking

APRIL ON THE FARM

is too heavy. That it is easy to ruin the grazing interests of cattle by too heavy a concentration of sheep is well known, and it is a common experience that under these conditions successful sheep-farming is determined by a low stocking. The possibilities of utilizing supplementary feeding at this period of the year have been extensively explored. Where arable land exists, crops of autumn-sown rye and vetches often provide valuable fare. On grass land the stimulation of the early bite of grass as a result of February applications of nitrogen also serves to ease the problems of this nature.

Horse-Breeding.—April is usually associated with horse-breeding as the beginning of the mating season, though it extends until July. Breeders of draught horses profess to be optimistic as to the future prospects of agricultural horses, and there is evidence that the rate of decrease in the horse population that has been characteristic of recent years is now diminishing. The improvement in the price of horses is also indicative of a diminished supply. This would appear to suggest that the place of the horse in relation to competitive motor transport has been satisfactorily defined. The accumulation of experience in industrial and other centres suggests that the horse is the more economical form of transport for heavy work over short distances, and particularly where frequent stoppages are necessary. This has been still further emphasized since the increases have taken place in motor taxation, insurance and fuel costs. It is necessary to appreciate, however, that there are problems that may have to be faced by the users of horse transport in areas of congested traffic. The exclusion of horse transport from such areas, as is sometimes seriously suggested, would do much to prevent the further increase in demand from industrial and commercial users that breeders desire.

The place of the horse in agricultural work is also to be regarded in a new light. The efficiency of the agricultural tractor is now accepted without question. At almost every turn its value is demonstrated in farming operations, and particularly for very heavy work and for covering large acreages in the shortest time. The actual cost per acre of an agricultural operation is often of less significance than the performance of the operation at the moment that experience indicates as likely to give the best results. This

APRIL ON THE FARM

is a point of considerable importance when applied to cultural operations and harvesting. The tractor, in short, has enabled the farmer to make better use of good weather, and this is often the solution of some of the most difficult problems that the farmer has to face. As in town transport, so also in farming practice, the horse has a definite place, but one cannot help feeling that even on the farm its place has been further weakened within the last year, especially since the introduction of tractors equipped with pneumatic tyres. The use of these tyres makes it possible to utilize farm tractors on a very much more extended scale, while in addition they will probably add to the life of the tractors. There is, however, one virtue that will always maintain a place for the horse on most farms, and that is its capacity for reproducing its species, with the consequent elimination of heavy depreciation costs that are experienced when tractors are employed.

The Influence of Type.—An analysis of draught-horse breeds indicates that there are marked differences of opinion as to the type most suitable for modern requirements. It would seem to be desirable, however, to concentrate on the draught-horse type primarily suitable for its agricultural uses. It can be logically argued that the horse most suitable for the farm is equally suitable for town haulage work, but this needs some qualification. For town work the best demand is for the weightiest and strongest horses that are available. On the farm there are other points that claim equal, and sometimes greater, attention. Thus, if the tractor is to do the heavy work, it may mean that a lighter- and cleaner-legged type of horse is more suitable for the farm. This is an opinion that finds some support amongst the breeders who identify themselves with the Suffolk and Percheron types.

The questions of disease and conformational deficiencies do not arise in such an acute form as at one time. It is an established fact that the Horse-Breeding Act, which makes the licensing of stallions compulsory and only provides for stallions being licensed that are free from hereditary diseases and are suitable for use as sires, has worked both smoothly and in the best interests of breeders as a whole. The cumulative effects of this control should not only add to the effectiveness of a breeding policy, but ensure greater efficiency from the average farm horse.

APRIL ON THE FARM

The one great weakness in most instances is that the selection of a sire is determined solely by type and soundness without any corresponding knowledge of the commercial merits. In the early days of the improved Suffolk breed of horses it is recorded that soft-hearted horses were eliminated by the pulling matches in which these animals engaged. When stallions can demonstrate their ability to stand up to the ordinary routine of farm work it is an added quality in their favour, and this requirement might be more generally adopted. It is of interest that some English owners of Percheron stallions use them regularly for farm work at the conclusion of the breeding season.

Mating.—The risks that attach to horse-breeding are generally greater than with other classes of stock. Apart from the factors responsible for mortality in both mares and foals, there is the outstanding fact that the fertility of horses is relatively low. In this respect the available evidence suggests that the draught-horse breeds, with 59 per cent. fertility, are more fertile than light-horse breeds with 54 per cent. If these figures applied to other stock, breeders would have reason to be dissatisfied with the results. Many causes are responsible for this low fertility and it is not always sound to attach the full blame to the mare. Infertility may be due to an inherited factor, but there is also the question of management. Some breeders assert that the provision of natural diet during the mating season is conducive to increased fertility. Our knowledge of the influence of management on fertility has been greatly increased by the research work at Cambridge and Edinburgh. Thus, it is recognized that a mare—or for that matter any animal—should be in a healthy, thriving condition when mated, while there is adequate scientific confirmation that she is more likely to hold to service when mated as she is going out of season. This arises from the fact that ovulation takes place on the last day of heat. The periods of heat last for from four to seven days and occur about every three weeks. In the case of a mare that has given birth to a foal, the first heat of the season occurs about nine or ten days after foaling, and breeders have long recognized that this is the best heat from the viewpoint of fertile mating.

The gestation period in the mare varies between 334 and 344 days, or in common reckoning eleven months. The consensus of opinion favours the month of May as the best

APRIL ON THE FARM

time for foals to be born. At this period the weather is usually more settled, while the availability of young grass is an added asset. Earlier foalings are favoured when the animals are intended for exhibition, but the risks are perhaps greater.

Root Breaks.—Work on root breaks is probably the most important of the arable duties during the month. The term now embraces a wider variety of crops than was originally associated with it. In the old days of strict adherence to the four-course rotation it normally implied work on land intended principally for turnips and swedes. The category is now widened by the inclusion of crops like mangolds, sugar-beet, potatoes, marrow-stemmed and thousand-headed kales, cabbage and associated foliage and forage crops. It is not easy to draw definite conclusions when comparing current and pre-war acreages under these particular crops. At first sight it may appear that root crops are less appreciated than formerly. Thus, turnips and swedes occupy only about half their former acreage and mangolds three quarters. Against this one has to recognize the great development of the beet-sugar industry, the added interest in potato culture, and the rival claims of kales, etc. The changes that have taken place are largely the result of economic considerations. Under purely arable conditions the decline in the fortunes of arable sheep and the substantial increases in the cost of labour have necessitated adjustments in cropping. The substitution of cash crops like potatoes and sugar-beet have proved to be economically sound, especially where such crops can be grown on a specialized scale. The extent to which expansion of area is desirable, as far as cash crops are concerned, is determined by the existence of a profitable market. Among the changes that are foreshadowed by the operation of marketing schemes, in so far as these affect crops like potatoes and hops, is the maintenance of a definite control over the acreage grown. This is an obviously sound principle to apply to any scheme that attempts to control produce that might be produced in excess of the market's requirements.

The reduction in the quantities of roots fed to dairy cows in winter is an additional explanation of the decline in the mangold acreage. There is also the fact that marrow-stemmed kale is being increasingly appreciated by reason of the lower cost of cultivation and the greater feeding

APRIL ON THE FARM

value derived, as compared with roots. There is need at this season of the year to think of the requirements of live stock next winter. The distribution of crops on the root break may well prove to be important, especially as the stocks of hay have disappeared quickly during the past winter. As a point of interest, the five-course rotation that is practised on the Midland College Farm allows for two root or forage breaks. This is one means of utilizing the large quantities of farmyard manure that are produced under an intensive form of farming. In recent years the growth of crops for home consumption has been regarded as more important than that of cash crops, and in the present season the 30 acres of root or forage breaks will be cropped as follows:—mangolds, 6 acres; kales, 6 acres; silage or soiling crops, 6 acres; potatoes, 9 acres; and sugar-beet, 3 acres. The writer is frequently in doubt about the relatively small acreage of sugar-beet by comparison with mangolds, but the distribution has worked well under the mixed type of farming practised, while the availability of a large reserve of stored mangolds is particularly useful for feeding from January until April or even into May.

The cultivation of cabbages for feeding to dairy cows in autumn and winter is popular throughout the Midlands. There have been few satisfactory comparisons between cabbages and marrow-stemmed kale, but it is interesting to observe that many dairy farmers prefer the cabbage to kale because it is more easily handled and more completely consumed. The great drawback of cabbage, however, is that once it reaches maturity, it quickly deteriorates.

NOTES ON MANURING

J. HUNTER SMITH, B.Sc., H. W. GARDNER, B.A.,
and C. E. HUDSON, N.D.H.,
Hertfordshire Institute of Agriculture, Oaklands, St. Albans.

Top Dressings for Cereals.—As has been pointed out in previous years (this JOURNAL, March, 1932, and April, 1933) the month of April is still not too late for profitable responses to be obtained from top dressings on autumn- or winter-sown cereals. In many experiments, nitrogenous artificials, applied well into May, have given as good results as the same amounts applied earlier in the year. The correct time, or times, for applying rapidly-acting top dressings is one of the many problems in agriculture that have not been sufficiently investigated to enable reliable rules to be deduced, so that at present the farmer has a wide latitude of choice and can fit in the operation conveniently with other farm work. Reasonable amounts to apply are 1 to 2 cwt. sulphate of ammonia (or its equivalent) for winter wheat or oats.

Effect of Rainfall on Response to [Nitrogen.—For every factor or influence that affects plant growth—temperature, moisture, food supply, etc.—there is, in general, a comparatively small range over which the particular factor has its most favourable effect on the plant concerned. Thus, each crop has its optimum range of temperature for germination; there is a small range of soil temperature within which the roots of a crop, e.g., tomatoes, grow most rapidly; there is a range of soil moisture content within which the cuttings of, say, carnations, root most readily. Many of these optimum conditions have been discovered by practical men in the course of hundreds or even thousands of years of trial and error, and it is by his acquaintance with this accumulated experience that the skilled grower, whether professional or amateur, is able to maintain such an amazing level of excellence.

The separate factors, besides directly affecting the plant, will, of course, influence each other. In the January notes, an example was given indicating the dominating effect of soil temperature on the response of grass to added nitrogen in early spring. Later in the year, it is possible for water

NOTES ON MANURING

supply to take the place of soil temperature in controlling the response to nitrogen. A common belief is that nitrogen gives the best response in wet seasons, but actually, under English conditions, the best results are given in seasons that would be described as dry. This has been pointed out by Professor Stapledon in "An Account of the Organization and Work of the Welsh Plant Breeding Station," p. 106: "One last point—which is that nitrogen has been responsible for its greatest relative increase in live weight in the dry year 1929. Taking all plots together, the average increase for three years, due to nitrogen, was 53 lb. per acre—in 1929, nitrogen had to its credit an increase of 107 lb."

Two of the present writers gave a similar example when reporting the results of four years' observations of the "new system" of grass land management in the *Journal of Agricultural Science*, October, 1931. Over a period of three years, 1928, 1929, 1930, the plots receiving sulphate of ammonia gave 23 per cent. more grazing than the controls: the variation was from 16.5 per cent. in 1930 to 36 per cent. in 1929. The absolute, as well as the percentage, increase was greatest in the driest year.

Obviously, however, since in the complete absence of water no plant growth can take place, these statements need qualification or more precise formulation. This has been done by Sir John Russell in "Artificial Fertilizers,"* where he gives the range of 22 to 40 inches annual rainfall as that within which nitrogenous manures give their best return. In other words, both under very dry and very wet conditions, the effect of nitrogen falls away.

The range given is still a very broad and general statement: with fuller information it will, in time, be possible to state it in terms of crops, distribution of rainfall, type of soil and so on. Thus at this Institute in 1932, when 11 in. of rain fell during the five months, April to August, the potato crop gave a response of 2.7 tons increase to a complete fertilizer containing about 1.5 cwt. sulphate of ammonia. In 1933 the low summer rainfall of under 6 in. for the same five months was far below the potato crop's requirement on the rather light land there: the crop was halved and there *was no response whatever* to artificial manures. On heavier soil, not many miles away, responses to nitrogen were obtained with the same crop, though these were not up to normal expectation.

* Bulletin No. 28, Ministry of Agriculture and Fisheries, p. 25.

NOTES ON MANURING

Organic Manures.—It will be obvious, from the latter part of the previous paragraph, that the optimum range of rainfall for the action of nitrogen cannot be expressed in terms of inches of rain alone. Similarly, many of the controversies that are always arising in agricultural matters are due to the point at issue not being precisely stated. Probably the old and ever-recurring controversy regarding the relative values of organic and inorganic fertilizers is an example of this kind. The comparison of sulphate of ammonia with, say, hoof and horns, on a soil already well supplied with dung or other organic matter is not likely to lead to the same result as on a soil very short of humus; and it is reasonable to suppose that, in a dry season on a soil inclined to scorch, an organic fertilizer might, by making just a slight difference to the moisture supply, prove superior to an equivalent amount of inorganic fertilizer. One could suggest many other *possible* conditions that might favour the organic manure.

There is, however, gradually accumulating, a considerable amount of evidence to justify the general statement that where high-grade organic and inorganic fertilizers are compared with one another as adjuncts to dung on a soil of moderate humus content, the difference between the two classes of manures is comparatively small. This is very well illustrated by an experiment carried out on modern lines in the glasshouses at the Institute over the two years 1932 and 1933. The four manures, dried blood, hoof and horns, sulphate of ammonia, and fish meal, were compared as sources of nitrogen in top dressings for tomatoes. The same total amounts of nitrogen, phosphate and potash were applied to all plots, but the mixture containing sulphate of ammonia was applied twice as often as the others and at half-rates. Treatments were repeated eight times over in randomized blocks.

<i>Year.</i>	<i>Dried Blood.</i>	<i>Hoof and Horns.</i>	<i>Sulphate of Ammonia.</i>	<i>Fish Meal.</i>	<i>Significant Difference.</i>
1932	54·9	55·05	54·15	56·12	2·64
1933	50·0	52·3	52·9	50·7	3·65
Av. two years	52·45	53·7	53·5	53·4	2·82

In spite of a low standard error, no significant differences were obtained in either or both years.

In the design of this experiment there is a serious defect

NOTES ON MANURING

that is to be found in thousands of other trials carried out with both plants and animals. All plots have been manured at the same level, and it is conceivable that this has, in each instance, been more than sufficient to ensure the maximum crop possible under the prevailing conditions. It is a matter of considerable importance that, where two fertilizers (or two foods) are being compared, there should be three levels of the nutrients concerned, viz., nil, a single and a higher (usually double) application.

In 1932, on the Institute Farm, there was obtained with potatoes a difference that was just significant in favour of organic fertilizer as against a home-made mixture of artificials. The results for a 5 by 5 latin square were:—

	1.	2.	3.	4.	5.	
	<i>No</i>	<i>Single Dose</i>	<i>Double Dose</i>	<i>Mixture</i>	<i>C.C.F.</i>	<i>Significant</i>
	<i>Arti-</i>	<i>Home-made</i>	<i>Home</i>	<i>with</i>	<i>No. 2.</i>	<i>Difference.</i>
	<i>ficials.</i>	<i>Mixture.</i>	<i>Mixture.</i>	<i>Organic M.</i>		
Tons per						
acre.	10'26	12'96	13'33	13'88	13'63	0'55

Treatments 3, 4 and 5 supplied the same amounts of nitrogen, phosphate and potash, but in 4 the nitrogen and phosphate were obtained from a high-grade guano. The difference between 3 and 4 is just significant but that between 4 and 5 is not big enough to be so regarded. In other parts of the country, where similar experiments were carried out, there was, on the average, no difference in favour of the organic fertilizer.

Importance of Supplies of Organic Matter.—The conclusions to be drawn from the preceding paragraph are that, under certain conditions not yet known, “organic” fertilizers *as a source of rapidly-acting nutrients required in the season of application*, may be slightly superior to “ordinary artificials,” but usually, and on the average, it is probable that there is nothing much to choose between them.

These statements must not, however, be taken to imply any minimizing of the important role that organic matter plays in soil fertility. Unfortunately the term “organic” is so wide in its scope that its use often serves to obscure the point at issue, e.g., chalk and mineral phosphate might be described as of organic origin but no one would regard their use as adding to the “organic matter” of the soil.

The majority of growers cannot be dependent on the so-called organic fertilizers to maintain the humus content

NOTES ON MANURING

of the soil: this must be done either by the use of dung or appropriate substitutes, such as artificial farmyard manure. The ploughing-in of catch crops, such as mustard, or of undersown crops, such as trefoil and crimson clover, is another measure that growers should consider as a possible method of conserving or adding to soil reserves of organic matter. Probably, for farming conditions, the most promising method is the wider use of two- or three-year or longer-duration leys in which wild clover is included. Such leys, if well managed on soils lacking in fertility, can fulfil three very valuable functions: they serve as a source of very nutritious animal food, whether in the form of grazing or of young hay; they provide a cheap and effective way of controlling weeds; and when ploughed up, the mass of clover and grass roots in the turf greatly improves the condition of the soil. To these main benefits from the well-managed ley, may be added the possibility of extending the length of the grazing season, both in spring and in autumn. By careful selection of the species for the mixture of grass and clover seeds sown, and by appropriate management of the resulting leys, the "early bite" becomes a reality of some value and significance, and late autumn, or even winter, grazing may be secured. There is, probably, no other crop of such flexibility, or presenting such opportunities for skilful management; the possibilities of the temporary ley have not as yet been adequately explored.

As an alternative method of increasing fertility, in certain areas in the south and south-east of England, the lucerne and sainfoin ley must also be mentioned. In spite of improved methods of inoculation for the former of these crops, the area under cultivation remains low and it would seem that other factors are responsible for its relative unpopularity. Here again there is plenty of scope for patient scientific investigation both in the laboratory and in the field.

Manuring as an Art.—In spite of the frequency with which the term "scientific" is used in modern agriculture and horticulture, it has to be admitted that most of the operations in both these occupations are still mainly an art and not a science. The art of manuring has, perhaps, been more highly developed in horticulture than in agriculture. It involves not only considerable experience in detecting signs of deficiency or over-supply by the appearance of the

NOTES ON MANURING

plants themselves (this was mentioned in the March notes), but also an intelligent anticipation of weather and market conditions.

Two examples may be used to illustrate this point. The first is taken from the practice of tomato growers who, early in the year, give their plants under glass a heavy dressing of potash with the object of producing the same type of sturdy, short-jointed growth as is obtained in the period of long daylight and much sunshine during the summer. The grower regards potash as a substitute for sunshine. Later in the season, when there is sufficient sunshine (or perhaps, as in 1933, even too much!), heavier dressings of nitrogenous manure are given to maintain growth and to enable the plant to produce a heavy crop.

The other example is from outdoor work. Last year a well-known lettuce grower, anticipating that the weather might continue dry for a long time, top dressed half his lettuces (in strips) with 10 cwt. per acre of meat meal. He knew that if the weather turned wet the lettuces that received this heavy dressing would be useless, but the other half would then have been marketable. Actually the top dressing made an enormous difference in growth, and, as the weather *did* remain dry, this half of the crop was marketed at a high price. This might be called an example of the combination of Practice, Science and Prescience.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended March 14				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	7 18d	7 18d	7 18d	7 18d	10 2
„ „ Granulated (N. 16%) ..	7 18d	7 18d	7 18d	7 18d	9 9
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20·6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium cyanamide (N. 20·6%) ..	7 5e	7 5e	7 5e	7 5e	7 0
Kainit (Pot. 14%) ..	3 6	3 0	2 17	3 0g	4 3
Potash salts (Pot. 30%) ..	5 4	5 1	4 17	5 0g	3 4
„ (Pot. 20%) ..	3 15	3 9	3 6	3 10g	3 6
Muriate of potash (Pot. 50%) ..	9 8	9 1	8 15	9 2g	3 8
Sulphate „ „ (Pot. 48%) ..	10 12	10 7	10 0	10 7g	4 4
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
„ (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26·27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16k	3 6
„ (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	7 15	6 17	6 15f	6 7	..
Steamed bone-flour (N. 4½%, P.A. 27½-29½%) ..	5 5	5 12	5 10f	5 7	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid
Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc. (Agric.),
Principal, Moulton Farm Institute, Northampton.

Effect of Feeding on "Cripples" in Lambs.—Stewart and Piercey have been investigating the condition known as "cripples" in lambs, common on many sheep farms in Northumberland. Elliott and Crichton had shown previously that the disease known as "bent leg" in lambs is probably rachitic. An experiment was consequently designed whereby groups of in-lamb Cheviot ewes were given a specially prepared cake containing 23 per cent. protein, 4.75 per cent. oil (containing cod-liver oil 2 per cent.), and 18 per cent. minerals. The minerals included a special mixture. The results, however, were negative. The special cake, although rich in cod-liver oil and minerals failed to increase the mineral content in the ewes' blood and did not prevent the occurrence of the disease in lambs. The blood of the ewes in the "fed" and "unfed" lots showed no significant difference. The milk from ewes producing crippled lambs was normal and so also was the blood of crippled lambs themselves.

Grading of Bacon Pigs.—The figures recently published show that the percentage of bacon carcasses graded A at factories during November and December last was 4.9 and 5.2 respectively.

A high standard of suitability for bacon production is mainly a matter of breeding and type, but can be affected by feeding. Although it is true that no method of feeding can convert a badly-bred store pig of unsuitable conformation into one yielding a grade A carcass, it is equally true that a suitable pig can be spoilt by improper feeding.

In a recent note it was pointed out that housing and feeding are intimately connected and that without warm and comfortable housing conditions in winter, good pigs of correct type may easily produce carcasses with too much or too soft fat. Any feeder who is getting disappointing results in the grading of his pigs at a factory would be well advised to get into touch with the County Agricultural Organizer for his county, so that he may get the pigs' rations checked, and where necessary adjusted. Suitably-balanced rations make a difference to cost of production and grade.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Protein equiv.
Wheat, British	£ 4 10	£ 0 8	£ 4 2	72	s. d. 1 2	d. 0-62	% 9-6
Barley, British feeding	5 15	0 8	5 7	71	1 6	0-80	6-2
" Argentine	4 10*	0 8	4 2	71	1 2	0-62	6-2
" Danubian	4 13	0 8	4 5	71	1 2	0-62	6-2
" Persian	4 12*	0 8	4 4	71	1 2	0-62	6-2
" Russian	4 18	0 8	4 10	71	1 3	0-67	6-2
Oats, English white	6 10	0 9	6 1	60	2 0	1-07	7-6
" black and grey	6 10	0 9	6 1	60	2 0	1-07	7-6
" Scotch white	6 10†	0 9	6 1	60	2 0	1-07	7-6
" Canadian No. 2 Western	7 3	0 9	6 14	60	2 3	1-21	7-6
" mixed feed	5 10	0 9	5 1	60	1 8	0-89	7-6
" Argentine	6 12	0 9	6 3	60	2 1	1-12	7-6
" Chilean	6 10	0 9	6 1	60	2 0	1-07	7-6
" Russian	6 12	0 9	6 3	60	2 1	1-12	7-6
Maize, Argentine	5 0	0 7	4 13	78	1 2	0-62	7-6
" Gal. Fox	4 18†	0 7	4 11	78	1 2	0-62	7-6
" Russian	4 15†	0 7	4 8	78	1 2	0-62	7-6
Beans, English Winter	5 15‡	0 16	4 19	66	1 6	0-80	19-7
Peas, Japanese	22 0§	0 14	21 6	69	6 2	3-30	18-1
Dari	7 10§	0 8	7 2	74	1 11	0-93	7-2
Milling offals—Bran, British	5 2	0 15	4 7	43	2 0	1-07	9-9
" broad	6 2	0 15	5 7	43	2 6	1-34	10
Middlings, fine imported	5 0	0 12	4 8	69	1 3	0-67	12-1
Pollards, imported	4 12	0 14	3 18	62	1 3	0-67	11
Meal, barley	6 7	0 8	5 19	71	1 8	0-89	6-2
" grade II	5 12	0 8	5 4	71	1 6	0-80	6-2
" maize	5 17	0 7	5 10	78	1 5	0-76	7-6
" germ	5 17	0 11	5 6	79	1 4	0-71	8-5
" locust bean	7 0	0 5	6 15	71	1 11	1-03	3-6
" bean	7 15	0 16	6 19	66	2 1	1-12	19-7
" fish	16 0	2 1	13 19	59	4 9	2-54	53
Maize, cooked flaked	6 5	0 7	5 18	84	1 5	0-76	9-2
" gluten feed	5 17	0 12	5 5	76	1 5	0-76	19-2
Linseed cake, English, 12% oil	9 5	1 0	8 5	74	2 3	1-21	24-6
" " " 9% "	8 17	1 0	7 17	74	2 1	1-12	24-6
" " " 8% "	8 12	1 0	7 12	74	2 1	1-12	24-6
" " " 6% "	8 17‡	1 0	7 17	74	2 1	1-12	24-6
Soya-bean cake, 5½% oil	8 2*	1 8	6 14	69	1 11	1-03	36-9
Cottonseed cake—English, Egyptian seed, 4½% oil	4 10	0 17	3 13	42	1 9	0-94	17-3
" " Egyptian, 4½% "	4 2	0 17	3 5	42	1 7	0-85	17-3
" " decorticated, 7% "	6 12†	1 8	5 4	68	1 6	0-80	34-7
" meal, decorticated, 7% "	6 10†	1 8	5 2	68	1 6	0-80	34-7
Coconut cake, 6% oil	6 0	0 18	5 2	77	1 4	0-71	16-4
Ground-nut cake, 6-7% oil	6 0*	0 18	5 2	57	1 9	0-94	27-3
" " " decor., 6-7% oil	7 0	1 7	5 13	73	1 7	0-85	41-3
" " " imported, decorticated, 6-7% oil	5 17	1 7	4 10	73	1 3	0-67	41-3
Palm-kernel cake, 4½-5½% oil	5 17§	0 12	5 5	73	1 5	0-76	16-9
" " " meal, 4½% oil	6 7§	0 12	5 15	73	1 7	0-85	16-9
" " " meal, 1-2% oil	5 5	0 12	4 13	71	1 4	0-71	16-5
Feeding treacle	5 0	0 8	4 12	51	1 10	0-98	2-7
Brewers' grains, dried ale	5 0	0 11	4 9	48	1 10	0-98	12-5
" " " porter	4 15	0 11	4 4	48	1 9	0-94	12-5
Dried sugar beet pulp (a)	5 2	0 5	4 17	66	1 6	0-80	5-2

(a) Carriage paid in 5 ton lots. *At Bristol. §At Hull. †At Liverpool.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of February, 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.06d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 7s. 6d.; P₂O₅, 2s. 1d.; K₂O, 3s. 6d.

NOTES ON FEEDING

Wheat v. Oats in a Laying Mash.—Recently the price of wheat has been low while the price of oats has risen to a relatively high level. On farms where ground oats have to be purchased for inclusion in the laying mash, an economy can be effected by substituting wheat meal for ground oats. Some time ago the usual laying mash employed on the Institute farm was altered in order to take advantage of the fact that wheat was cheap, and to make the adjustment necessary on account of the difference in composition between the new weatings and the old sharps. The alteration has proved entirely satisfactory and has resulted in a saving of about 14s. per ton. Both mixtures are given below:—

New Mixture.

10 per cent. fish meal
20 per cent. weatings
30 per cent. bran
20 per cent. wheat meal
20 per cent. maize meal

Old Mixture.

10 per cent. fish meal
30 per cent. sharps
20 per cent. bran
20 per cent. Sussex ground oats
20 per cent. maize meal

Plus 1 lb. salt and 2 lb. cod liver oil per 100 lb. of the mixture.

The mash is given in conjunction with a corn mixture consisting of equal parts (by weight) of wheat and kibbled maize.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	4 13
Maize	78	7.6	4 18
Decorticated ground-nut cake	73	41.3	7 0
„ cotton cake ..	68	34.7	6 12

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.28 shillings, and per unit protein equivalent, 1.47 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table (p. 84) is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1933, issue of the Ministry's JOURNAL, p. 784.)

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d. net.

MISCELLANEOUS NOTES

FARM VALUES.

Crop	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9.6	5 6
Oats	60	7.6	4 8
Barley	71	6.2	5 0
Potatoes	18	0.8	1 4
Swedes	7	0.7	0 10
Mangolds	7	0.4	0 10
Beans	66	19.7	5 13
Good meadow hay	37	4.6	2 14
Good oat straw	20	0.9	1 7
Good clover hay	38	7.0	2 19
Vetch and oat silage	13	1.6	0 19
Barley straw	23	0.7	1 10
Wheat straw	13	0.1	0 17
Bean straw	23	1.7	1 12

MISCELLANEOUS NOTES

The French Chambers of Agriculture

THE following information is taken from a communication received from the Commercial Counsellor of the British Embassy at Paris:—

Although originally constituted by a law of 1851, revoked in the following year, and again in 1919, by legislation that had no effect, the real existence of chambers of agriculture in France dates from December, 1924, by decree under a third law passed in January of that year. The first constituent elections were held in February-March, 1927.

Each Department of the country has one chamber, situated at its chief town, and the members are elected in two ways. Four members are elected for each district (*arrondissement*), or electoral constituency, from a list known as "universal agricultural suffrage," the electors, under the law, being the landlords and usufructuries, *métayers*, farmers who give part of the produce as their rent (*colons partiaires*), heads of farms, managers, workers on regular wage or by the day, former agriculturists, women who are heads of farms, etc. The other members, one for each constituency, also elected from a list, are selected by the Departmental agricultural associations, credit funds, co-operatives, etc., each of these bodies having votes in proportion to the number of its subscribers. Elections are triennial, half the members being elected each time; members thus sit for six years. At the election in

MISCELLANEOUS NOTES

February, 1933, 885 outgoing members were re-elected and 336 were elected for the first time. At present, there are 90 chambers in France and Algiers, with 1,965 members.

Chambers hold two ordinary meetings a year, one in May, the other in December. Office holders are elected in May for one year, but may be re-elected. Sittings are private. The Prefect of the Department may be invited to attend, as well as other persons whom the chambers wish to consult. Directors of the official agricultural and veterinary services are always admitted.

The 1933 budgets of the 90 chambers in France and Algeria showed receipts amounting to about 5,600,000 frs., in round figures, an average of 62,500 frs. per chamber, obtained, under the 1929 law, from additional "centimes" (that may not exceed 10) to the principal tax on land not built upon (*contribution foncière des propriétés non-bâties*).

Under the law, the chambers, as regards the authorities, are the advisory and vocational organs of the agricultural interests in their respective constituencies. They forward recommendations and give the Prefect and the Government information and opinions if required; decide, for legal purposes, the agricultural usages of their districts; arbitrate in disputes between proprietors, farmers and workers; and institute or subsidize any establishment, institution, or services, etc., of agricultural interest. They may concert with chambers of commerce in collective enterprises with a common interest for agriculture, industry, and trade. They have the right, also, subject to approval by the Minister of Agriculture, to form themselves into regional chambers, and 13 such chambers are now in existence.

The presidents and delegates of the chambers meet in Paris periodically, usually in March and October: the last such meeting was held on October 16-17, 1933. This assembly deliberates on questions that have been the subject of previous inquiry in the chambers, and the conclusions may, therefore, be regarded as the considered opinion of all the agricultural chambers in France. A permanent secretariat has been established in Paris as a centre of information, and to co-ordinate the activities of the 90 chambers. It publishes a monthly bulletin—*Les Travaux des Chambres d'Agriculture*.

The work of the chambers is both national and local. They represent agricultural industry on various departmental organizations. Some of them have instituted com-

MISCELLANEOUS NOTES

missions to record the prices of agricultural produce, a task of undoubted utility in view of the inadequacy of the quotations in most local markets. In co-operation with the Prefects, they are often concerned with delicate questions, such as the fixed price of bread, basic wages, the assessment of land, and the consolidation of local usages. Almost everywhere, too, the chambers have started or encouraged agricultural schools, domestic schools, after-school courses and centres of specialized study.

The Official Seed Testing Station in the Year 1932-33*

THE Station tested 30,499 samples in the twelve months ended July 31, 1933. This is 190 fewer than in the previous year, which was a record. The number of samples received from outside sources was, however, 27,839, or 140 more than in 1931-32, which had been a record also in this respect. This is more than gratifying, showing as it does the continuation and indeed the increase in the confidence accorded by the public to the work of the Station. A noteworthy feature was the marked increase in the number of samples of wheat submitted for test; this was obviously attributable to the renewed interest taken in this crop as a result of the establishment of the wheat quota. The number of samples tested for investigational purposes was 2,660. The investigations in question dealt mainly with lack of vitality in storage, but every year special problems arise which are too diverse to enumerate in the official report. Study was continued of the impurities normally present in imported cereals of different origins. As an outcome of this work the Station has already been able to assist outside inquirers, and is now in a position to form a very reliable opinion from laboratory examination alone as to the countries of origin of the great majority of samples of imported cereals which may come into its hands.

Much work has again been done on the relation between the germination of peas and of various Brassicas in the laboratory and greenhouse and that obtained in the field. The Station has been able to show, in certain cases of failure of "plant" in the field, that this was due to abnormal soil or climatic conditions and not to faulty germination.

The Wild White Clover Growing-On Committee met on June 20, and examined the plots sown in 1932 together with a number of others upon which no definite recommendation

* Extracted from the Fourteenth Report of the National Institute of Agricultural Botany, Cambridge, 1932-33.

MISCELLANEOUS NOTES

could be made in 1932. The number of plots passed up till July 31 was 569, and the number sown was 821.

No seed-testing course was held in 1933, nor was there a seed analysts' conference, but reference samples of different types of seeds were prepared by the Station and were distributed by the Ministry of Agriculture to the licensed stations.

Basis for Redemption of Tithe Rentcharge

THE Minister of Agriculture and Fisheries announced on Feb. 5 that, for the purpose of the redemption of tithe rentcharge, for which application is made after Feb. 6, 1934, until further notice, the compensation for redemption will be 29 times the net amount of the tithe rentcharge after the deductions prescribed by the Tithe Acts, 1918 to 1925, have been made.

The Agricultural Index Number

THE general index number of agricultural produce for February at 112 was 2 points below the previous month, but was 6 points above the figure recorded for February, 1933. The fall of 2 points on the month was due principally to the reductions which occurred in the index numbers for fat cattle, sheep and milk.

Monthly index number of prices of Agricultural Produce.
(Corresponding months of 1911-13 = 100.)

Month.	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	—
April	146	137	123	117	105	—
May	144	134	122	115	102	—
June	140	131	123	111	100	—
July	141	134	121	106	101	—
August	152	135	121	105	105	—
September	152	142	120	104	107	—
October	142	129	113	100	107	—
November	144	129	112	101	109	—
December	143	126	117	103	110	—

Grain.—Wheat at an average of 4s. 5d. per cwt. was 1d. dearer than a month earlier and the index rose one point to 60. If allowance is made for the "deficiency payment" under the Wheat Act, 1932, the index would be increased to approximately 135 and this would have the effect of raising the general index from 112 to 117. Barley, however, depreciated in price by 2d. to 9s. 2d. per cwt. and was 4 points lower at 113. A sharp advance of 11d. to 6s. 5d. per cwt. was recorded in the average for oats, due to the

MISCELLANEOUS NOTES

effects of the additional duties which were imposed on foreign oats on January 13, and the index in consequence was 11 points higher at 91. A year ago the indices for wheat, barley and oats were 71, 84 and 85 respectively.

Live Stock.—Second quality fat cattle averaged about 6*d.* per live cwt. less than in January, whereas a rise occurred between January and February in the base years and the index was 3 points lower at 103. A further increase of $\frac{1}{4}$ *d.* per lb. occurred in the average for fat sheep but, as this addition was proportionately less than that which took place in the pre-war period, the index declined 5 points to 112. Bacon pigs were 9*d.* and pork pigs 2*d.* per score lb. dearer and the former recorded a 4 points advance in the index to 129. That for porkers, however, fell one point to 135. Quotations for dairy cows continued to depreciate and a reduction in the average of 18*s.* per head was reflected in the drop of 4 points in the index to 101. Store cattle, however, were slightly dearer and rose 2 points to 92. Both store sheep and store pigs realized higher prices during February but in both instances the increases were proportionately less than those which occurred in February, 1911-13, and the relative index numbers were 2 and 4 points lower at 91 and 159.

Dairy and Poultry Produce.—The contract price for sales of milk in the South-Eastern region of England was 1*d.* per gallon lower in February and the index for February was 161 as compared with 166 a month earlier. Cheese again sold at slightly higher values and was 15 per cent. dearer than pre-war; butter, however, declined by 1*d.* per lb. and the index reached the record post-war low level of 86, a fall of 6 points on the month. The seasonal fall of 2*d.* per dozen in the price of eggs was again rather more severe than usual and the index declined a further 2 points to 95. All descriptions of dead poultry were a little dearer and the combined index for poultry was 118 as compared with 115 in January.

Other Commodities.—There was a further slight drop in the prices for potatoes during February and the average at £3 17*s.* per ton was precisely the same as in the base period, a fall of 4 points on the month. Quotations for hay were unaltered and the combined index of 79 was repeated. Green vegetables continued to become dearer and realized more than double pre-war prices but onions and carrots cheapened slightly. The rise in wool prices was again

MISCELLANEOUS NOTES

apparent during February and an average increase of $\frac{1}{4}$ per lb. caused the index to advance 5 points to the pre-war level.

MONTHLY INDEX NUMBERS OF PRICES OF INDIVIDUAL COMMODITIES. (CORRESPONDING MONTHS OF 1911-13=100.)

Commodity	1932	1933			1934	
	Feb	Feb.	Nov.	Dec.	Jan.	Feb.
Wheat	76	71	61	61	59	60
Barley	101	84	110	111	117	113
Oats	102	85	76	75	80	91
Fat cattle...	119	107	100	97	106	103
„ sheep...	100	106	110	106	117	112
Bacon pigs ...	95	98	104	109	125	129
Pork „ ...	106	109	118	126	136	135
Dairy cows ...	121	111	107	106	105	101
Store cattle ...	123	107	85	85	90	92
„ sheep ...	96	82	90	86	93	91
„ pigs ...	114	117	144	147	163	159
Eggs	102	117	108	99	97	95
Poultry	123	122	120	110	115	118
Milk	146	150	161	166	166	161
Butter	107	100	95	97	92	86
Cheese	132	113	105	106	114	115
Potatoes	275	113	115	112	104	100
Hay	72	65	78	80	79	79
Wool	78	63	81	84	95	100

Revised index numbers due to Wheat Act payments.

Wheat	—	132	133	136	136	135
General Index	—	110	114	115	119	117

Further Research on Foul Brood of Bees

THE disease, or group of diseases, known as Foul Brood, which has for many years been the cause of serious losses to bee-keepers in this country and many other parts of the world, is the subject of a fresh investigation at the Rothamsted Experimental Station. The disease was investigated in England nearly 50 years ago, by Cheshire and Cheyne, and in more recent times by various workers in the United States, Canada and Europe; but little is yet known about its cause, or the possibilities of cure or prevention.

The Rothamsted Experimental Station has been engaged for some years in research on bees, and recently endeavoured to obtain the resources that would make it possible to appoint a competent bacteriologist to make a serious

MISCELLANEOUS NOTES

study of bee diseases. The necessary funds have now been provided through the co-operation of the British Bee-Keepers' Association (which has agreed to raise half the required amount) and the Agricultural Research Council (which is contributing the other half). A sum of £500 a year has thus been made available for the study of Foul Brood, and it is hoped that the work may continue for at least three years.

Dr. H. L. A. Tarr has been appointed to carry out the investigations, which have already been started. Dr. Tarr obtained his B.A. and M.A. degrees at the University of British Columbia, and his Ph.D. in the Department of Bacteriology at McGill University in 1931, since when he has been working on bacteriological problems in the Biochemical School at Cambridge University.

The necessary laboratory accommodation has been provided in the Entomology Department at Rothamsted, and the investigation is being carried out under the general direction of Dr. C. B. Williams, Head of that Department, with the co-operation of Mr. D. M. T. Morland, apiarist. Some of the purely bacteriological work will be carried out at the Lister Institute in London, which has offered to co-operate in every way; and the Experimental Station will have the advice, on the practical side, of a small committee of expert bee-keepers.

Although the maintenance expenses of the investigation are assured, and the ordinary equipment of a good laboratory is provided, there still remains a heavy initial outlay, estimated at £250, for specialized apparatus that is essential to give the investigation the fullest chances of success. Towards this expense, some donations have already been received, but further contributions will be greatly welcomed, and they should be sent to Sir John Russell, D.Sc., F.R.S., Director of the Rothamsted Experimental Station, Harpenden, Herts. A list of donors will be published in due course.

Farm Workers' Minimum Rates of Wages.—Meetings of the Agricultural Wages Board were held at 7, Whitehall Place, London, S.W.1, on March 13 and 20, 1934, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and made the following Orders:—

Devonshire.—An Order fixing minimum and overtime rates of wages to come into operation on March 25, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue

MISCELLANEOUS NOTES

in force until September 29, 1934. The Order provides for the continuance of the present minimum rate for male workers of 21 years of age and over of 31s. per week of 50 hours in winter (except in the weeks in which Good Friday and Easter Monday fall, when the hours are 41 instead of 43 as formerly) and 52 hours in summer (except in the week in which Whit Monday falls, when the hours are 43). The overtime rates throughout the period are 8½d. per hour on weekdays and 10d. per hour on Sundays, and for all overtime employment on the hay and corn harvests (instead of 8d. and 9½d. per hour respectively as at present). The minimum rate for female workers of 21 years of age and over is 6d. per hour and for female workers of 20 and under 21 years of age 5½d. per hour (instead of 5d. per hour for workers of 20 years of age and over as at present) for all time worked.

Durham.—An Order fixing minimum and overtime rates of wages to come into force on May 14, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until May 13, 1935. The minimum rates for male workers of 21 years of age and over are as follows: horsemen who are householders, 32s. (instead of 31s. as at present) per week of 50 hours, with, in addition, 7s. per week to cover all time spent in attention to horses; horsemen who are not householders, 31s. (instead of 30s. as at present) per week of 50 hours, with, in addition, 3s. 6d. per week to cover all time spent in attention to horses; horsemen who are boarded and lodged by their employers, 31s. (instead of 30s. as at present) per week of 50 hours and all time spent in attention to horses; stockmen and shepherds, per week of the hours customarily spent in attention to stock, householders, 43s. (instead of 42s. as at present); non-householders, 36s. 10½d. (instead of 35s. 11d. as at present); workers boarded and lodged, 35s. (instead of 34s. as at present). For casual workers the minimum rate is unchanged at 6d. per hour and for other male workers the minimum rate is 29s. (as at present) per week of 50 hours. The general overtime rate for all classes of male workers of 21 years of age and over, other than casual workers, remains at 8d. per hour, and that for employment on Saturday afternoon, Sunday, Christmas Day and Good Friday at 9d. per hour. For female workers of 18 years of age and over the minimum rates are unchanged at 2s. 6d. per day of 8 hours, with overtime at 4d. per hour.

Essex.—An Order fixing minimum and overtime rates of wages to come into force on March 25, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until March 23, 1935. The minimum rates for male workers of 21 years of age and over are 30s. (as at present) per week of 50 hours (instead of 52 as at present) in any week in summer (except in the weeks in which Easter Monday and Whit Monday fall, when the hours are 41½ instead of 43 as formerly), and 48 hours in winter (except in the week in which Christmas Day and Boxing Day fall, when the hours are 31 instead of 39½ hours in the week in which Christmas Day falls), with overtime throughout the year at 9d. per hour on weekdays (including Easter Monday, Whit Monday and Boxing Day) and 10d. per hour on Sundays and on Christmas Day. For female workers of 21 years of age and over the minimum rate is unchanged at 5½d. per hour for all time worked.

Gloucestershire.—An Order fixing minimum and overtime rates of wages to come into force on April 8, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until October 6, 1934. The minimum rates for

MISCELLANEOUS NOTES

male workers of 21 years of age and over are as follows: head carters 34s. 6d. (instead of 32s. 9½d. as at present) per week of 58 hours; head shepherds and head stockmen 36s. (instead of 34s. 2½d. as at present) per week of 60 hours; under carters 32s. 6d. (instead of 30s. 10½d. as at present) per week of 54 hours; under shepherds and under stockmen 34s. 6d. (instead of 32s. 9½d. as at present) per week of 57 hours, and other male workers 30s. (instead of 28s. 6d. as at present) per week of 50 hours. The overtime rates for all male workers of 21 years of age and over remain at 8½d. per hour on weekdays and 10½d. per hour on Sundays. The minimum rate for female workers is 5d. per hour (instead of 4½d. as at present) irrespective of age.

Herefordshire.—An Order fixing minimum and overtime rates of wages to come into force on May 1, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until April 30, 1935. The minimum rates are as follows: for male workers of 21 years of age and over employed wholly or mainly as bailiffs, waggoners, stockmen or shepherds 35s. (as at present) per week (including Sunday) for all time necessarily spent on the immediate care of animals (not exceeding 60 hours), with overtime at 9d. per hour (instead of 8½d. per hour as at present), except for employment on Christmas Day and Good Friday where a worker has completed less than 60 hours in the weeks in which those holidays fall, when the rate is 2d. per hour; for other male workers of 21 years of age and over 30s. (as at present) per week of 48 hours in winter (except in the week in which Christmas Day falls, when the hours are 39½), and 54 hours in summer (except in the week in which Good Friday falls, when the hours are 44½), with overtime at 9d. per hour (instead of 8½d. per hour as at present); and for female workers of 18 years of age and over 4½d. per hour with overtime at 6d. per hour, except for employment on Christmas Day and Good Friday, where a whole-time worker has completed less than 46½ hours in the weeks in which those holidays fall, when the rate is 1½d. per hour.

Lancashire.—An Order continuing the operation of the existing minimum and overtime rates of wages from May 1, 1934 (i.e., the day following that on which the existing rates are due to expire) until April 30, 1935. The minimum rates for male workers of 21 years of age and over are: in the Southern area, stockmen and teamsmen 35s. per week of 52½ hours and other workers 32s. per week of 50 hours, and in the remainder of the area of the Committee, stockmen and teamsmen 38s. and other workers 35s. per week of 60 hours in each case. The overtime rate for all classes of male workers of 21 years of age and over throughout the county is 9d. per hour. For female workers of 18 years of age and over the minimum rate is 6d. per hour for all time worked.

Norfolk.—An Order continuing the operation of the existing minimum and overtime rates of wages from March 25, 1934 (i.e., the day following that on which the existing rates are due to expire) until December 29, 1934. The minimum rates for male workers of 21 years of age and over are 30s. per week of 50 hours in summer (except in the week in which Good Friday falls when the hours are 42) and 48 hours in any week in winter (except in the week in which Christmas Day falls when the hours are 40), with, in addition, in the case of workers employed as teamsmen, cowmen, shepherds or yardmen, 5s. 6d. per week, and in the case of sheep tenders and bullock tenders 4s. 6d. per week in lieu of overtime in respect of work in connexion with animals, other than such work on Good Friday and Christmas Day (in respect of which an additional sum of 5s. is payable, except where a day's

MISCELLANEOUS NOTES

holiday on full pay is given in the weeks in which those holidays fall or in the following weeks). The overtime rates for all male workers of 21 years of age and over are 9d. per hour on weekdays and 11d. per hour on Sundays. For female workers of 18 years of age and over the minimum rate is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

Sussex.—An Order continuing the operation of the existing minimum and overtime rates of wages from March 26, 1934 (i.e., the day following that on which the existing rates are due to expire) until April 14, 1935. The minimum rates for male workers of 21 years of age and over are: for workers employed wholly or mainly as horsemen, cowmen, stockmen or shepherds, 36s. per week of 58 hours (except in the weeks in which Good Friday, Whit Monday and Christmas Day fall, when the hours are 50), and for other workers 31s. per week of 52 hours in summer (except in the weeks in which Good Friday and Whit Monday fall when the hours are 44), and 48 hours in winter (except in the week in which Christmas Day falls when the hours are 40). The overtime rates for all classes of adult male workers are 9d. per hour on weekdays and 10½d. per hour on Sundays. The minimum rate for female workers of 18 years of age and over is 5d. per hour, with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

Radnor and Brecon.—An Order continuing the operation of the existing minimum and overtime rates of wages from May 1, 1934 (i.e., the day following that on which the existing rates are due to expire) until October 31, 1934. The minimum rates for male workers of 21 years of age and over are 29s. 6d. per week of 50 hours in winter and 54 hours in summer, with overtime at 9d. per hour. For female workers of 18 years of age and over the minimum rate is 5d. per hour, with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

Enforcement of Minimum Rates of Wages.—During the month ended March 14, 1934, legal proceedings were taken against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.	Court	Fines imposed.			Costs allowed.			Arrears of wages ordered.	No. of workers involved.
		£	s.	d.	£	s.	d.	£ s. d.	
Cheshire ..	Macclesfield	2	0	0	3	10	0	4 5 6	1
Derbyshire...	Belper	*			—			—	2
Durham ...	South Shields	1	0	0	—			77 9 3	2
Notts....	Nottingham	5	0	0	—			19 19 2	2
Yorks, W.R.	Bradford	3	0	0	5	0		16 9 1	1
do.	Rotherham	2	0	0	2	6		22 0 0	1
Pembroke & Cardigan	Cardigan	*			—			—	1
do.	Newport	*			—			—	1
		£13	0	0	£3	17	6	£140 3 0	11

* Case dismissed.

NOTICES OF BOOKS

The Planning of Agriculture. By Viscount Astor and Keith A. H. Murray. Foreword by Sir Arthur Salter. Pp. xvi + 186. (Oxford: The University Press; London: Humphrey Milford. 1933 Price 6s.)

The keynote of this thoughtful and obviously sincere exposition of the agricultural situation, as seen by the authors, is that a policy of expansion at the expense of the consumer must always be precarious in such a country as ours. It follows, therefore, that the book is directed more to finding a stable basis on which to reconstruct agriculture than to suggest remedies for the more immediate troubles of the industry. It will almost certainly appeal to politicians and economists rather than to those concerned with making a living from the land. Action for to-day, and planning for to-morrow is probably more in line with farmers' thoughts on the subject.

The authors see the natural field for development in live stock, dairying, poultry, fruit, flowers and vegetables. In contrast, wheat and sugar are considered to be the least suitable for expansion, or even for attention of any kind. In their zeal for live stock, which are said to account for the bulk of the farm income, "even in the Eastern Counties," the authors are subscribing to a popular academic notion that will not be accepted, without qualification, by a large body of farmers who know the difference between gross income and net profit. The practical man is the last person to belittle the importance of live stock in the scheme of things, but, as far as beef, at least, is concerned, he has seen little, if any, direct profit therefrom, for a good many years. The reverse prospect seems almost too good to be true.

It may well be doubted, however, whether any useful purpose is served by attempting to differentiate crops from stock. The authors, even, seem to recognize their inter-dependence: "the burden of surplus cereal production and consequent low level of cereal prices fell first on the grain-growers themselves, but now, after a lag of some years, it weighs heavily on the live-stock farmers." Theoretically, it may be possible to fatten stock independently of the arable regions, but the live-stock policy will have to be a very attractive one before stock-raisers will entertain the project. Having regard to the consumer, would such a policy be any less precarious than one that, while recognizing the indispensability of wheat and the utility of beet in maintaining the arable area, is not unmindful of the interests of farmers, generally, as well as of consumers.

Regarding marketing reorganization and the raising of prices by restricting supplies as methods of affording a measure of agricultural relief, the authors seem to have discovered a mare's nest: "the deliberate restriction of output is likely in the long run to antagonize the urban voter. Furthermore, there is no guarantee that restricted output for many commodities will result in an increase of price sufficient to raise total returns to the British farmer. For those commodities with an elastic demand, such as beef, mutton, lamb, butter, eggs, a very large reduction in output is required to raise the price even slightly. The increased price is not likely to be sufficient to offset the decreased sales. A policy to restrict the output of the more important British commodities, if attempted, would be difficult to justify." On this reasoning, one is tempted to inquire just how the authors would propose to re-establish the industry on the commodities mentioned. The following statement hardly makes the prospect more encouraging: "the town voter, however, might be

NOTICES OF BOOKS

willing to help the farmer by paying more for beef and mutton, early vegetables, butter and similar quasi-luxury foods if he were assured of cheap flour and bread, milk, sugar, bacon and potatoes."

The authors cite many difficulties that are never likely to arise, and much that is condemned is either non-existent or is in the course of being rectified.

It is suggested that if the various marketing boards get busy allocating quotas, the whole balance of the farm will be upset. "Pig quotas will bear no relation to grain or butter production If the farmer has a lot of poor grain on his hands, he cannot increase his hens because his egg quota is fixed." Apart from the suggestion being a little premature, most farmers find that both pigs and poultry can be developed without in any way interfering with the balance of the farm, or affecting the output from other departments.

Even in regard to what the authors describe as one of the main lines of improvement in agricultural production that awaits action, namely, co-operative effort to secure standardization in the type of stock and crops raised, some progress has been made. Most people will agree that the urgent call for standardization must meet with its first response on the farm, and that the speeding-up of better methods rests largely with the State. Chapter IX, "Reorganization of the Farm," may wholeheartedly be commended to the attention of all concerned with agricultural education.

Lord Astor and Dr. Murray have produced a stimulating and suggestive book, but one does find some difficulty in making headway through a maze of seemingly conflicting statements.

Recent Advances in Plant Physiology. By E. C. Barton-Wright, M.Sc. (Lond.), F.R.S.E. 2nd Edition. Pp. x + 341 and 54 Figs. (London: J. and A. Churchill. 1933. Price 12s. 6d.)

This book is primarily intended to provide a summary of the more important advances in plant physiology for the use of students taking an advanced course in botany; but it also contains useful information for those interested in the scientific principles underlying the successful cultivation of crops. That a new edition has been called for only three years after first publication affords proof that the work has been found generally useful.

The book is divided into nine sections dealing with the following subjects: absorption of water and transpiration; carbon assimilation; nitrogen metabolism; the raw materials of plant nutrition; translocation; respiration; and growth. References to the more important original papers are given at the end of each section, and there are separate indexes of authors and subjects. The subject matter of the first edition has been considerably reorganized. A great deal of the information concerning the soil has been omitted, and new topics more directly concerned with the plant itself have taken its place.

Of special interest to agriculturists is the summary of the relation between leguminous crops and the nodule-producing organism *Bacillus radicicola*, and the work of Mason and Maskell on the translocation of carbohydrates in the cotton plant. Those interested in the effect of electricity on plant growth, or the physiological reasons for pruning apples, will find up-to-date information on these subjects. The account of the recent work on the respiration of stored apples is of considerable economic interest, as is also that of the nature and chemistry of alcoholic fermentation. Another important subject dealt with is the work of Maximov on the transpiration of xerophytes.

There are signs that the book has been written rather hurriedly. This is indicated especially by the frequent use of such slang expressions as "rough and tumble experiments" (p. 87), to cite but one instance. Moreover, the author having, on p. 20, defined the transpiration of a plant as "evaporation of water from its aerial parts,"

NOTICES OF BOOKS

states, on p. 43, that "Transpiration is not solely a simple process of evaporation."

On the whole, however, this work forms a valuable and reliable guide to recent research in the field of plant physiology.

Poultry Diseases, including Diseases of other Domesticated Birds. By B. F. Kaupp, B.S., M.S., D.V.M. 6th ed., revised and enlarged. Pp. 444; 168 illust. (London: Baillière, Tindall & Cox. 1933. Price 18s. 6d.)

First published twenty years ago, the present greatly enlarged edition of this profusely-illustrated and well-produced work indicates, to some extent, the many new problems in disease that have arisen during that period, and the study and research that have been instituted for their solution.

Starting with two chapters on the anatomy and physiology of the fowl, the author next devotes attention to the useful subject of sanitation; but it is difficult to understand why, under that heading, notes on chick-rearing troubles and the normal and abnormal appearances of organs, etc., should have been included. There is some useful information on the external and internal parasites of fowls. The main portion of the book naturally deals with diseased conditions due to various causes; and it is rather surprising to find, in this section, that treatment is recommended for diseases due to bacteria, viruses and protozoa. With most of such diseases, treatment is absolutely contra-indicated, since it may leave a bird as a carrier and disseminator of the particular disease and, even were a cure effected, it would not be a paying proposition.

In dealing with remedies for poultry diseases (Chapter XXIII), it would be well, perhaps, to add a word as to the necessity, when disease occurs, of obtaining expert advice to ensure a correct diagnosis. The information on remedies, in the hands of poultry owners, might often prove a danger, as the indiscriminate dosing of birds tends to spread disease, and may thus result in great loss to an owner and to the poultry industry generally.

Sisal: A Note on the Attributes of the Fibre and their Industrial Significance. By S. G. Barker, Ph.D., D.I.C., F.Inst.P., M.I.Chem.E., F.R.S.E., F.Z.S., F.T.I. Pp. 74. Empire Marketing Board Report No. 64 (London: H.M. Stationery Office. 1933. Price 1s.)

The most important Empire source of sisal is British East Africa, and the material from which the industry there has been built up was obtained from Florida in 1893. Up to the present, the principal commercial use of this crop has been in the manufacture of cordage ropes, twine, etc., and particularly binder twine, but modern developments in agricultural engineering indicate that in the future, with the increasing use of the combine-harvester, the demand for binder twine is likely to be reduced. Consequently the authorities in British East Africa have been considering alternative uses for the product and methods of producing variable qualities suitable for more exacting manufactures than that of binder twine. A Sisal Experiment Station is proposed to provide facilities for the development of work in genetics and plant physiology as related to this plant. The publication of Professor Barker's monograph is the more welcome because it provides a conspectus of the present state of scientific knowledge on the cultivation of the plant, the production of the fibre, and its possible uses.

In the countries of origin, sisal has been used for purposes other than those that give it its value on the international market—for example, it is used for the manufacture of hammocks, hats, braid, sacking, etc. Its future market may be found mainly in the manufacture of cords and fine yarns. To this end, tests have been carried out by the Imperial Institute to determine whether it can be satis-

NOTICES OF BOOKS

factorily substituted for manilla in making marine cordage. The results of the tests have been generally favourable, and sisal is being partially adopted for this purpose by the Royal Navy. Such defects as have been observed are considered likely to be overcome by systematic scientific investigation and research. The manufacture of cordage from sisal involves the production of a large amount of waste material, and investigation is proceeding as to the possible utilization of this waste as pulp for paper, as material for millboard, and for the production of power alcohol. It is, however, still uncertain whether these uses are economically practicable. In the immediate future there is likely to be a large surplus of sisal available for other purposes, and it is evident that the present state of knowledge does not provide adequate information regarding possible alternative uses of the material. Dr. Barker believes that further research work will discover new uses that will absorb the production, and may also be of invaluable service in providing an outlet for other fibres in which the tropical Empire is rich.

Studies in Tropical Land Tenure. By H. Martin Leake. Pp. 56. (Port-of-Spain, Trinidad: Imperial College of Tropical Agriculture. 1933. Price 2s.)

In this brochure, which consists of a series of articles reprinted from "Tropical Agriculture," Dr. Leake sets out in considerable detail the various systems of land tenure found in the different tropical components of the British Empire. The lands dealt with are India, the West Indies, the Eastern Colonies (Malaya and Ceylon), East Africa (Kenya, Uganda, Nyasaland and Tanganyika), West Africa (Gold Coast, Nigeria, Sierra Leone and the Gambia), Fiji, Mauritius, and the Sudan. The subject is treated under the general headings of (a) the plantation system (where the land is appropriated by the colonists and a plantation system of production adopted), and (b) the peasant system (where the land continues in the hands of the natives with whom a system of trading is set up), and the history and development of each of these systems is fully traced. Attention is drawn to the extreme diversity of the systems of land tenure in spite of the fact that, in all instances, the wealth of these lands is primarily and dominantly agricultural.

Dr. Leake goes on to show the weaknesses of the two systems mentioned, and develops the view that the way of prosperity lies in a system that he terms "vertical co-operation." This he describes as a true partnership between the peasant, the productive organization and the State, by which the revenue is automatically adjusted to actual production, and by which the State reaps its share of the incremental value.

The brochure concludes with a useful list of books bearing on the same subject.

Report on Co-operation in India and Europe. By L. D. Gammons. Pp. 314. (Singapore: Government Printing Office. 1933.)

This book is the report, by the Assistant Director of Co-operative Societies in Malaya, on a six months' tour of investigation into the co-operative movement in India and certain states of Europe. It is concerned with both agricultural and urban co-operation. The author does not claim that his studies are at all exhaustive; nevertheless they provide a good general account of co-operation in the countries visited.

The most informative surveys are those of Indian co-operation, since the literature available on this subject is more limited than that on European co-operative developments. The areas studied were Madras, Bengal, the United Provinces, the Punjab, Bombay and Hyderabad. Co-operative banks and credit societies are very fully described; but interesting accounts are also given of other types of societies, e.g., for marketing, better farming and rural construction.

NOTICES OF BOOKS

In Europe, the countries studied were Denmark, Holland, Germany, Czechoslovakia, Great Britain, the Irish Free State and Ulster. A good bird's-eye view of the co-operative position in each is given, and the author's critical comments are also of interest.

The concluding part of the report consists of recommendations for co-operative development in Malaya, in the light of experience gained from the countries investigated.

Hatchery Management. By R. C. Hartman, B.S.A., and G. S. Vickers, M.S. Pp. xiv + 386, and 108 figs. (New York: Orange Judd Publishing Co., Inc. 1932. Price \$2.75.)

This volume describes the operation of the large commercial hatcheries in the United States of America. While conditions in this country differ widely from those prevailing in America, it is of interest to learn how such hatcheries have been built up, and how they maintain their business. The first half of the book shows how success depends on locality, type of plant and methods of management, and the regulations and precautions that must be observed when large numbers of hatching eggs are purchased. The latter part deals mainly with the advertising and office side of the business, concluding with a bibliography containing references on many matters of interest to the poultry-keeper.

Traité d'Économie Rurale: Tome I, La Terre. (*Treatise on Rural Economy: Part I, The Land*.) By Albert Delos. Pp. 271. (Gembloux: Jules Duclot. Paris: Librairie Agricole de la Maison Rustique, 26, Rue Jacob. 1932. Price 38 frs.)

This volume, issued on the initiative of a group of Professors of the Institut Agronomique at Gembloux, Belgium, is one of a series intended, when complete, to form a comprehensive collection of textbooks on subjects included in the Institute's courses of instruction. For the purposes of this particular survey, rural economy is regarded as having two aspects—one embodying the fundamental sciences upon which agricultural work is based, and dealing with the general internal economy of the farm; the other covering the external relations of the individual agricultural unit, i.e., its relations with local and world markets. The first aspect, the internal economy of the farm, is influenced by three factors—land, capital and labour; and it is to the study of the first of these factors that this book is devoted, the nature and value, improvement, operation, and taxation of land being discussed, as well as the systems of cultivation adopted in Belgium.

Although, at the present time, economics in general, and farm economics in particular, are recognized by the Professorial Editors as presenting some difficulties, they approach their task in an optimistic spirit. This treatise has, consequently, been written comprehensively from the economic standpoint; it deals with its subject in considerable detail, and derives its examples from current practice in Belgium, avoiding the besetting sin of the classical economists, who were apt to invent circumstances to fit particular theories. The writer, M. Delos, has thus successfully achieved the primary purpose of a textbook, which should be a statement of present knowledge for students and not a vehicle for startling developments in theory. As presenting the views of an eminent authority of another country, the book will have a special interest for British students of the subject.

Open Air Dairying: A Survey of Farms Using Milk Bails in 1932. By R. N. Dixey and M. Messer. Pp. 79. Publication of the Agricultural Economics Research Institute, University of Oxford. (Oxford: The Clarendon Press; London: Humphrey Milford. 1933. Price 2s. 6d.)

This survey gives a clear and unbiased account of the experiences of farmers in this country, who have adopted the milk bail system.

NOTICES OF BOOKS

It is a very interesting and useful record, and well worth perusal by anyone who desires information on this method.

The Rabbit Book. By F. L. Washburn, M.A. 2nd ed., revised. Pp. 200; 83 figs. (London: J. P. Lippincott Co. 1933. Price 8s. 6d.)

In this book, the Professor of Economic Vertebrate Zoology at Minnesota University deals comprehensively with the various aspects of rabbit husbandry. In the preliminary chapters, attention is drawn to the larger market for rabbit flesh existing in various countries; also, to the growing demand for rabbit fur, partly as a consequence of the diminishing supplies of the more expensive pelts of highly-esteemed fur-bearing animals, and partly as a result of the great improvement in rabbit pelts through selective and careful breeding. The economic basis of the rabbit industry having been discussed, the following chapters deal with the establishment of rabbitries, and with breeding, nutrition and general management. There is a section on the killing of rabbits, and the grading and preparation of carcasses for market; and another section deals with rabbit diseases and their treatment. The concluding chapters discuss fur production and the profitable disposal of pelts. Intended, primarily, for the amateur, the book should prove of interest and value to those who keep rabbits for a hobby or as a remunerative sideline.

The Handling and Storage of Grain, with Special Reference to Canadian Methods. By H. H. Broughton, M.I.Mech.E. Pp. 174. (London: Institution of Mechanical Engineers, Storey's Gate, London, S.W.1. 1933. Price 10s.)

This paper formed the subject of discussion at meetings of the Institution of Mechanical Engineers in London, Bristol and Manchester. It summarizes in concise form the mechanics of grain handling and storage with particular reference to the Canadian elevator system. It discusses details of elevator design as influenced by the requirements of receiving, shipping, storage and distribution, and reference is made also to special problems of mechanical and electrical equipment.

The main emphasis, however, is laid not so much on elevator equipment, design and layout as on the method of construction. In this connexion, the author expounds and advocates the use of "moving forms" in the construction of concrete elevators. This method, he claims, is much speedier, is more economical and gives better results than others, such as fixed or semi-mobile shuttering. As regards speed of construction, for example, 6 feet vertical per day is quoted as the rate of construction of a Canadian elevator with moving forms, as compared with the rate of 1 ft. 6 in. vertical per week attained in the building of a concrete silo at a British port by the old methods. Further, the relative costs of the moving form and the fixed shuttering methods of construction are given as 3d. and 8d. per sq. foot of surface respectively.

Many important points of detail are brought out in a full report of the well-informed discussion that followed on the paper. The author's suggestion for the storage of a national grain reserve in the United Kingdom, at a cost of 2s. per quarter, did not altogether escape the shafts of the critics. The publication as a whole forms a very valuable addition to the literature on the subject of grain storage.

La petite Ferme Danoise ou Husmandshus (*The Danish Smallholding*). By M. H. Motte. Pp. 135. (Paris: Librairie Agricole de la Maison Rustique, 26, Rue Jacob. 1933. Price 7.70 francs.)

Mr. Motte has written an interesting and instructive little volume on Smallholdings—"Husmandshuse"—in Denmark. These holdings are of 25 acres or less and their prosperity in the latter half of the nineteenth century induced the Government, by a law of 1899, which

NOTICES OF BOOKS

has given rise to much further legislation, to promote the creation of Statshusmandshuse. It is with these State small-holdings, of which there are 100,000 in Jutland alone, that the book is mainly concerned. These State farms are very uniform in kind, and M. Motte gives a detailed description of the organization of a typical farm. There are interesting sections dealing with the various classes of produce and the live stock on the farms, copiously illustrated from official statistics. There is also a chapter on the co-operative methods that play a large part in the success of these farms.

The author clearly has an intimate knowledge of his subject, and the book gives a fascinating and reliable picture of the life of the Danish small-holder.

Tithes and Variable Rentcharges. By P. W. Millard, LL.B. Pp. vii + 79. (London: Butterworth and Co., Ltd. 1933. Price 7s. 6d.)

The author of this work was until recently head of the Tithe and Copyhold Branch of the Ministry. He has given a short and interesting account of the way in which various rentcharges payable out of land came to be imposed, and, where these payments are variable, of the changes made at different times in the methods of calculating them. The subjects dealt with range from tithe rentcharge and corn rents in lieu of tithe to such comparatively little known payments as rentcharges payable on the commutation of rights affecting copyhold land in a manor, rentcharges payable out of allotments awarded for the labouring poor under Inclosure Acts and the "Vicar's Rate" payable in Halifax. The greater part of the volume is devoted to a summary account of legislation in regard to tithes and tithe rentcharge in which the author sets out the circumstances attending the passing of each of the Tithe Acts, viz., those of 1836, 1891, 1918 and 1925, which constitute the landmarks in the history of this subject. Remission and the recovery of tithe rentcharge are also dealt with, and the book affords a handy means of acquiring information concerning tithe generally.

The Care and Repair of Ornamental Trees. By A. D. C. Le Sueur, B.Sc., F.S.I. Pp. xiv + 257, and 42 Illustrations. (London: Country Life Ltd. 1934. Price 10s. 6d.)

Starting from the reproach that "the English love their trees, but do not understand them," the author has written the first book to be published in this country on the care of those trees which are planted for amenity rather than for timber production. The book should be of much value to all who are responsible for the care of trees in parks, gardens and streets. Wound treatment and the maintenance of vigour are fully dealt with, while information concerning pruning, planting, and "trees and the law" is also given. Especially valuable and attractive are the photographs, which illustrate all the main practical points that are touched upon in the text.

Fighting the Insects: The Story of an Entomologist. By L. O. Howard. Pp. xvii + 333. (New York: The Macmillan Co. London: Macmillan and Co., Ltd. 1933. Price 12s. 6d.)

This is a book of reminiscences. First as assistant and then from 1894 till 1931 as Chief of the Bureau of Entomology of the United States Department of Agriculture, the author has taken a leading part in the rapid development of applied entomology in America in the past fifty years. Frequent visits to Europe and travel throughout the world have made him acquainted with entomologists everywhere, and have given him an unexampled experience of entomological problems. No one was more fitted to write the "tale of an entomologist," and, in this book, Mr. Howard has gathered together a fund of personal stories and experiences full of interest and charm. The volume forms

ADDITIONS TO THE LIBRARY

a kind of supplement to the author's earlier "History of Applied Entomology" and will have permanent value as a record of one of the greatest of the pioneers in the field of economic entomology.

Simple Pruning. By N. Catchpole. Edited by A. J. Macself. Second ed. Pp. x + 133, and Illustrated. (London: W. H. and L. Collingridge Ltd. 1934. Price 2s. 6d.)

Few problems appear to worry amateur gardeners more than that of pruning, and for them this work is specially designed. Within a small space has been brought a great deal of useful information, covering the pruning of flowering shrubs, roses, fruit trees, hedges and evergreens. Although essentially practical, the fundamental principles of pruning are explained in order that the work may be intelligently carried out. Simple language, numerous illustrations and a moderate price are other features that contribute to make the book attractive to the amateur gardener.

ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous

Watson, J. A. S., and More, J. A.—Agriculture: The Science and Practice of British Farming. Third Edition revised and enlarged. (x + 777 pp. + 35 pl.) Edinburgh and London: Oliver and Boyd, 1933, 15s.

The British Science Guild.—The Alexander Pedler Lecture, 1933. The Organization of Agriculture, by Sir Daniel Hall. (13 pp.) London, 1933, 1s.

Leighton, Clare.—The Farmers' Year. A Calendar of English Husbandry. (54 pp., including engravings.) London: Collins, 1933, 10s. 6d.

Flavigny, P.—Le régime agraire en Angleterre au XIXe siècle. (271 pp.) Paris: Les Editions Internationales, 1933.

American Society of Agricultural Engineers.—Report of an Inquiry into Changes in Quality Values of Farm Machines between 1910-14 and 1932. (165 pp.) St. Joseph, Michigan, 1933, 50 cents.

Russell, Sir E. J.—Books and the Farmer. (An Address delivered at 10th Annual Conference of the Association of Special Libraries and Information Bureaux at Bristol, 1933.) (16 pp.) London, 1933, 1s.

Scottish National Development Council.—Scottish Agriculture. Economic Series No. 2:—Report of Committee on Arable Farming in Scotland. (46 pp.) Glasgow, 1933, 6d.

Ostler, H.—Farmers' and Merchants' Reckoner for all Agricultural Products. Edinburgh and London, 1933, 2s. 6d.

Gelman, A. K., and Chapman, P. W.—The Young Man in Farming. (ix + 216 pp.) New York: John Wiley & Sons; London: Chapman & Hall, 1933, 10s. 6d.

Loyo, G.—La Concentracion Agraria en el Mundo. (188 pp.) Mexico, 1933.

Mukerjee, R.—Land Problems of India. (x + 369 pp.) London: Longmans, Green, 1933, 9s.

Childs, W. M.—Making a University. An Account of the University Movement at Reading. (xvi + 312 pp.) London: Dent, 1933, 6s.

The Scapa Society.—Rural Refuse and its Disposal, by Ethel B. Ashford and H. Baker. (50 pp. + 1 plate.) London: 71, Eccleston Square, 1933, 1s.

Finch, W. Coles.—Watermills and Windmills. A Historical Survey of their Rise, Decline and Fall as Portrayed by those of Kent. (336 pp. + plates and maps.) London: The C. W. Daniel Co., 1933, 15s.

Medical Research Council.—Special Report Series No. 187:—The Chemistry of Flesh Foods and their Losses on Cooking, by

ADDITIONS TO THE LIBRARY

- R. A. McCance and H. L. Shipp.* (146 pp.) London: H.M. Stationery Office, 1933, 2s. 6d.
- Medical Research Council.*—Special Report Series No. 189:—Tuberculosis Infection in Milk. A Report by the Department of Health for Scotland. (38 pp.) London: H.M. Stationery Office, 1933, 9d.
- Millard, P. W.*—Tithes and Variable Rentcharges: Some Aspects of their History and Development. (vii + 73 pp.) London: Butterworth & Co., 1933, 7s. 6d.
- Associated Country Women of the World.*—What the Country Women of the World are Doing. Festivals Number. Edited by S. Watt. (258 pp.) London, 1933. Paper 2s., Cloth 3s. 6d.
- Institut International d'Agriculture et Bureau International du Travail.*—Etudes sur les mouvements des populations rurales. I. L'exode rural en Allemagne. (160 pp.) Rome, 1933, 15 lire.
- Institut International d'Agriculture.*—Protection des forêts et des cultures agricoles contre le vent. (264 pp.) Rome, 1933, 20 lire.
- Howard, A. L.*—A Manual of the Timbers of the World. Their Characteristics and Uses. Revised edition. (xxiii + 672 pp.) London: Macmillan, 1934, 36s.
- Windett, Nancy.*—Australia as Producer and Trader, 1920—1932. (xvi + 320 pp.) Oxford at the University Press; London: Humphrey Milford, 1933, 15s.

Meteorology

- Meteorological Office.*—A Short Course in Elementary Meteorology, by W. H. Pick. Fourth edition revised. (143 pp. + 1 pl.) London: H.M. Stationery Office, 1933, 2s. 6d.
- Shaw, Sir N.*—The Drama of Weather. (xiv + 269 pp.) Cambridge at the University Press, 1933, 7s. 6d.

Botany

- Good, R.*—Plants and Human Economics. (xii + 202 pp. + 8 maps. Cambridge at the University Press, 1933, 5s.
- Burr, S., and Turner, Dorothy M.*—British Economic Grasses. Their Identification by the Leaf Anatomy. (94 pp.) London: E. Arnold & Co., 1933, 10s. 6d.
- Bean, W. J.*—Trees and Shrubs Hardy in the British Isles. Vol. III. (xiv + 517 pp. + 64 pl.) London: Murray, 1933, 36s.

Plant and Animal Breeding

- Imperial Bureau of Plant Genetics.*—Plant Breeding in the Soviet Union. Achievements, Organization and Future Programme of the Institute of Plant Industry. (58 pp.) Cambridge and Aberystwyth, 1933, 3s. 6d.
- Smith, A. D. B., and Robison, O. J.*—The Genetics of Cattle. I. A Survey of the Literature upon the Inheritance of Milking Capacity. Reprint from *Bibliographia Genetica* X, 1933. (104 pp.) Edinburgh: Institute of Animal Genetics, 1933.
- Imperial Bureau of Animal Genetics.*—The Technique of Artificial Insemination, with an Introductory Chapter by A. Walton. (56 pp.) Edinburgh and London: Oliver and Boyd, 1933, 2s. 6d.

Agricultural Economics

- Astor, Viscount, and Murray, K. A. H.*—The Planning of Agriculture. (xvi + 186 pp.) Oxford at the University Press; London: Humphrey Milford, 1933, 6s.
- United States Department of Agriculture.*—Economic Trends affecting Agriculture. (46 pp.) Washington: Government Printing Office, 1933, 5 cents.

ADDITIONS TO THE LIBRARY

- U.S.A. Senate*.—73rd Congress, 1st Session, Document No. 70:—*World Trade Barriers in Relation to American Agriculture*. (540 pp.) Washington, 1933.
- South-Eastern Agricultural College, Wye*.—Department of Economics, Report No. XVIII:—*Financial Results on the College Farms. IV. General Financial Results for six years, 1926/27 to 1931/32*, by J. Wyllie and N. V. Hewison. (Pp. 123-157.) Wye, 1933, 2s.
- Institut International d'Agriculture*.—*Comptabilité agricole: Recueil de statistiques pour 1929-30*. (87 + 616 pp.) Rome, 1933, 50 lire.

Marketing

- Simmat, R.*—*The Principles and Practice of Marketing*. (xvii + 247 pp.) London: Pitman, 1933, 12s. 6d.
- The Royal Empire Society*.—Pamphlet No. 9:—*The Marketing of Milk*. Address by Sir E. Grigg. (12 pp.) London, 1933, 3d.
- Knapp, J. G.*—*The Hard Winter Wheat Pools. An Experiment in Agricultural Marketing Integration*. (ix + 180 pp.) Chicago: University of Chicago Press, 1933, \$1.50.
- Gokhale Institute of Politics and Economics*.—Publication No. 3:—*A Survey of the Marketing of Fruit in Poona*, by D. R. and V. R. Gargil. (viii + 184 pp.) Poona, 1933, Rs. 2.8.

Field Crops

- Percival, J.*—*Wheat in Great Britain*. (125 pp. + 63 plates.) Published by the Author at Leighton, Shinfield, Reading, 1934, 10s. 6d.
- Imperial Bureau of Plant Genetics: Herbage Plants*.—Bulletin No. 12:—*Lucerne: Its Ecological Position and Distribution in the World*, by M. Klinkowski. (61 pp. + 1 pl.) Aberystwyth, 1933, 3s. 6d.

Horticulture

- Wright, W. P.*—*The Wright Encyclopædia of Gardening*. (xvii + 614 pp. + 1 pl.) London: J. M. Dent & Sons, 1933, 15s.
- Berks, R.*—*Garden Science. A Three Years' Course of Practical Science Based on Experiments in Garden, Field and Classroom*. (123 pp.) London: Nelson, 1933, 2s.
- Seabrook, W. P.*—*Modern Fruit Growing*. Fourth edition. (xi + 202 pp.) London: Benn, 1933, 7s. 6d.
- Macself, A. J.*—*Special Manures for Garden Plants, including Formulæ for Particular Plants as Prescribed by Dr. A. H. Griffiths*. (viii + 152 pp.) London: W. H. & L. Collingridge, 1933, 3s. 6d.
- Royal Horticultural Society*.—*Cultivation of Lettuce for Market*, by F. A. Secrett and W. F. Bewley. (20 pp.) London, 1933, 6d.
- United States Department of Agriculture*.—Circular No. 278:—*The Commercial Storage of Fruits, Vegetables and Florists' Stocks*. (40 pp.) Washington, 1933.
- Switzerland, Secrétariat des Paysans Suisses*.—Publication No. 105:—*La production et la vente des légumes en Suisse*. (150 pp.) Brougg, 1933.
- Le Sueur, A. D. C.*—*The Care and Repair of Ornamental Trees in Garden, Park and Street*. (xiv + 257 pp. + 35 pl.) London: Country Life, 1934, 10s. 6d.

Plant Pests

- Grainger, J.*—*Virus Diseases of Plants*. (viii + 104 pp. + 6 pl.) Oxford at the University Press; London: Humphrey Milford, 1934, 6s.
- Appel, O.*—*Taschenatlas der Gemüsekrankheiten*. (24 tafeln.) Berlin: Paul Parey, 1933, RM. 5.

ADDITIONS TO THE LIBRARY

Live Stock

- Miller, W. C., and Robertson, E. D. S.*—Practical Animal Husbandry. (xv + 316 pp.) Edinburgh and London: Oliver and Boyd, 1934, 12s. 6d.
- Troupeau-Housay, J.*—Moutons de plein air. Elevage et engraissement à l'herbage et au pacage. (146 pp.) Paris: Librairie Agricole de la Maison Rustique, 1933, 7 fr.
- Imperial Bureau of Plant Genetics: Herbage Plants.*—Bulletin No. 10:—Grazing. Papers read at the Meeting of the British Association for the Advancement of Science at Leicester on September 11, 1933, by *P. F. Astill, William Davies, M. G. Jones* and *A. Bridges*. (22 pp.) Aberystwyth, 1933.

Poultry, etc.

- Rice, J. E., and Botsford, H. E.*—Practical Poultry Management. Third edition. (xxi + 592 pp. + 2 pl.) New York: John Wiley; London: Chapman & Hall, 1933, 16s. 6d.
- Notts Education Committee.*—The County Poultry Handbook, 1933. (39 pp.) Nottingham, 1933.
- Reichsministerium für Ernährung und Landwirtschaft.*—Berichte über Landwirtschaft. (Neue Folge.) 58 Sonderheft:—Die deutsche Eierstandardisierung, von *A. Walter* und *G. Lichter*. (100 pp.) Berlin: Paul Parey, 1932.
- Brechemin, L.*—L'élevage moderne et l'industrie du lapin. (195 pp.) Paris: Librairie Agricole de la Maison Rustique, 1932, fr. 8.50.

Bees and Bee-keeping

- Mace, H.*—Modern Bee-Keeping. Revised edition. (225 pp. + 16 pl.) Harlow: Bee-Keeping Annual Office, 1933, 5s.
- Rendl, G.*—The Way of a Bee. Translated from the German by *P. Kirwan*. (vi + 168 pp.) London: Longmans, Green & Co., 1933, 6s.

Dairying and Dairy Products

- Raison, C. (Edit.).*—The Milk Trade. A Comprehensive Guide to the Development of the Dairy Industry. 2 Vols. (513 pp. + 24 pl.) London: Virtue & Co., 1933, 36s.
- University of Oxford, Agricultural Economics Research Institute.*—The Effect of Butter and Cheese Supplies on "Surplus" Milk Prices, by *R. L. Cohen* and *K. A. H. Murray*. (19 pp.) Oxford, 1933, 1s.
- South-Eastern Agricultural College, Wye.*—Dept. of Economics, Report No. XVII:—Food Recording and Cheaper Milk Production, by *M. A. Knox*. (39 pp.) Wye, 1933, 2s.
- Bibby's Book on Milk.*—Section 1. Being a Scientific Study of some of the many problems connected with Milk; its Production and Distribution. Second edition. (55 pp.) Liverpool: J. Bibby & Sons, 1933, 7s. 6d.
- The Royal Sanitary Association of Scotland.*—Memorandum by the Council of the Association on the Further Control of the Milk Supply from a Public Health Standpoint. (26 pp.) 1933.
- United States Department of Agriculture.*—Technical Bulletin No. 381:—Feeding Value for Milk Production of Pasture Grasses when grazed, when fed green and when fed as Hay or Silage. (47 pp.) Washington, 1933.

Veterinary Science, etc.

- Linton, R. G.*—Veterinary Hygiene. Second edition. (xix + 472 pp.) Edinburgh: W. Green & Son, 1934, 21s.
- Imperial Bureau of Agricultural Parasitology.*—Notes and Memoranda No. 10:—The Helminth Parasites of Marsupials. (62 pp.) St. Albans, 1933, 4s.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 2 May, 1934

NOTES FOR THE MONTH

Rothamsted Conference on the Cultivation of Light Land

THE Rothamsted Conferences on present-day farming problems provide a broad view of various aspects of the agricultural industry and the way in which leading farmers are adapting their methods to suit changing conditions. They also set out the contributions of the scientific specialists towards the solution of the purely technical questions.

The Conference, held on March 20, was concerned with Modern Changes in the Cultivation of Light Land, and a large gathering listened to several well-known exponents of light land cultivation, the methods outlined carrying conviction both by their originality and the energy with which they had been pursued.

It is not possible to give here more than a summary of leading points, but the proceedings will be published in full by the Station. It was clear that there is no "best system" for light land in general. The value of the successful experience recorded at such meetings can only be realized by those who are prepared to take a hint here and a line of policy there, and mould them to their own conditions.

Mr. A. J. Hosier (Marlborough, Wilts) gave an interesting account of the methods he has adopted, with great success, in reclaiming light, hill arable and down land (on the Chalk) that no longer paid under sheep and corn farming. He had solved the key problem of humus supply on such soils by manuring, through dairy cattle and poultry on the open-air "bail" and folding systems, respectively. Long leys also contributed to this result. By suitable management, it was possible to sow foul arable land down

NOTES FOR THE MONTH

to grass and plough it out clean and in high fertility three years later, thus cashing the manurial residues. Poultry and cows were at least as good as sheep for maintaining light land; they lived in a kind of symbiosis, the cattle keeping the grass short for the hens, while the hens manured the grass for the cattle. Under his system, the best use that Mr. Hosier has yet found for his straw is to spread it on his pastures.

Mr. W. Parker (King's Lynn) had a very different problem in the reclamation of several thousand acres of acid, blowing sand in Norfolk. When taken over, the land was going out of cultivation. Starting operations on more or less normal lines with the 4-course rotation, the results were only moderate. Success came with deep ploughing that had the double effect of breaking the pan and bringing up some chalk from below. Sugar-beet became a possibility, and its introduction raised the whole level of the rotation. Chalk and depth of soil together led up to the cultivation of lucerne on a very large scale in conjunction with a drying plant for the manufacture of lucerne meal. All operations in connexion with this crop have been completely mechanized. Mr. Parker has a novel method of harvesting that possesses many advantages. Grain is threshed in the field, whether damp or not, and is dried, dressed, and bagged up in a continuous process. Mr. Parker has been able to employ long leys with excellent effect on his light soil. Polled Angus crosses and Masham sheep are grazed on these leys in contrast with Mr. Hosier's dairy cows and hens.

Mr. A. W. Oldershaw (E. Suffolk) then outlined the methods that had been adopted in dealing with poor, acid, sandy heath-land in his area. On the E. Suffolk County Council Farm at Tunstall Mr. Oldershaw has given a striking demonstration of how the combination of chalking, suitable manuring with artificials, and a proper rotation can completely transform the cropping powers of such land. Untreated, the soil will grow medium crops of oats, lupins, and potatoes; on the limed areas, excellent crops of all kinds, including sugar-beet and lucerne, can be produced. Deep ploughing is a feature of the system, and a high standard of cultivation is set. In contrast with the previous two speakers, Mr. Oldershaw does not include long leys in his system, and regards his land as quite unsuited to permanent grass.

NOTES FOR THE MONTH

Some of the dangers of continuous cropping on light land were dealt with by Dr. H. H. Mann of Woburn, illustrating them by the results of fifty years cropping on the classical fields of that Station. He pointed out that no system of animal or artificial manuring yet tried had sufficed to maintain the fertility of the soil when the same crop was grown year after year. Part of the trouble might be due to disease, as the early potato growers in Bedfordshire had found out to their cost; but this was not the whole story. Some other factor was involved which so far had not received the scientific study it deserved.

The impression gained from the Conference was that there are very considerable possibilities inherent in light soils that on their face value might seem almost worthless.

The Use of Seaweed as Manure

ALL round the coasts of the British Isles seaweed has a high reputation as manure. Of the various species collected for that purpose *Laminaria* and *Fucus* predominate; *Ulva* and *Zostera* occur in lesser quantity.

Laminaria, popularly known as "drift-weed," "Mayweed," "tangle," "kelp" or "ore-weed," grows immediately below low-water mark. The average potash content of the dry stems is 10-12 per cent.; of the dry fronds about 5 per cent.; and of the ash 20-30 per cent.

Fucus ("wrack," "black-wrack," "bladder-wrack" or "cut-weed") is found between tide marks. The potash content is only 3-4 per cent. in the dried weed and about 12 per cent. in the ash. On many coasts, however, particularly in sheltered waters, *Fucus* is more plentiful than *Laminaria*, and may be cut from rocks at low tide, whereas *Laminaria* must be washed ashore or be cut from a boat.

Ulva ("green laver" or "sea lettuce") and *Zostera marina* ("grass wrack") flourish in quiet bays and creeks, where they are washed ashore in large quantities. *Zostera* is poor in both potash and nitrogen, but *Ulva* is rich in nitrogenous compounds; the dried fronds contain up to 4.75 per cent. of nitrogen.

Manurial Value.—Seaweed contains the following constituents of manurial value: Nitrogen, phosphoric acid, potash, common salt and organic matter. The proportions actually present depend on the species of weed, the amount of water and sand, and the degree of decomposition, but as ordinarily carted in wet condition it contains roughly the following quantities per ton (percentages in parentheses): Nitrogen, 11 lb. (0.5); phosphoric acid, 2 lb. (0.09); potash, 27 lb. (1.2); salt, about 35 lb. (1.6); organic matter, 400 lb. A well-handled sample of farmyard manure contains on the average about 11 lb. nitrogen, 6 lb. phosphoric acid, 15 lb.

NOTES FOR THE MONTH

potash, and 380 lb. organic matter per ton; the quantity of salt is negligible. Fresh seaweed is an organic manure similar in its nitrogen and organic matter content to ordinary dung. It is about twice as rich in potash, much poorer in phosphate and has a high proportion of common salt. The nature of the nitrogen and organic matter in seaweed is such that decay is rapid, and there is evidence that the decay of strawy manure is hastened by being composted with seaweed. The potash in seaweed is readily available, and is apt to be washed out when the weed is heaped and left exposed to the weather. When spread, however, the potash removed is retained in the soil.

Seaweed is excellent for potatoes, particularly when supplemented with superphosphate. The effect of salt (disadvantageous where high-quality potatoes are aimed at) may be reduced by applying the seaweed in autumn or winter.

Seaweed may be used for crops that require large amounts of potash and are benefited by salt, e.g., mangolds, sugar-beet, clover, pasture, and cabbages. Barley responds both to potash and salt when grown on very light soils. The light sandy soils so common round the coast are usually potash-deficient and lend themselves to treatment with seaweed.

Fresh seaweed should not be allowed to rot in heaps in the open; it is best to plough it in at once. Alternatively the wet weed may be composted with long farmyard manure containing a high proportion of litter. Dried seaweed may be stored in stacks with little loss. An advantage of seaweed is its freedom from weed seeds and spores of disease organisms.

Local Practice.—In the British Isles, seaweed is specially valued in certain localities. The following notes are based on information kindly furnished by the Agricultural Organizers for Cornwall and Kent, and the Director of the Jersey State Experimental Station.

CORNWALL —Seaweed (mainly *Laminaria*) collected in autumn, mixed with sea-sand, farmyard manure and refuse material and allowed to rot, is largely used in market-gardening districts. The "pile" is turned in early spring and when in short condition is ploughed in, 10-12 tons per acre, with artificials, mainly phosphatic, for early potatoes to be followed by broccoli. Occasionally the weed is ploughed in fresh after a late broccoli crop. Around Penzance it is beneficial for peas, lettuce and market cabbages, and on the general farm for root crops, principally cattle-cabbage and mangolds.



Photo H C Long

Sticks of Seaweed by the roadside St. Ouen Bay Jersey



Photo H C Long

Seaweed stuck on the high beach St. Ouen Bay Jersey.

NOTES FOR THE MONTH

ISLE OF THANET.—Seaweed is found to be markedly effective on the type of land existing in Thanet, particularly on light or shallow soil. It is ploughed in "green" in summer and autumn, or, after it has been mixed with farmyard manure, and rotted, spread in November or December. In addition to its manurial action the weed appears to exert a beneficial effect on the moisture-retaining capacity of the land. It has proved excellent for broccoli and green crops, and, when mixed with dung, for potatoes. The quantity applied varies from 15-30 tons per acre; it can be obtained free for the carting.

JERSEY.—Both rock-rooted weed and cast up "drift-weed" are collected, and up to 40 tons per acre are applied to sandy soils near the coast soon after the crop following early potatoes is harvested. Seaweed is also dried and stacked, for application at about 14 tons per acre later in the season. When dried quickly and not exposed to rain, the weed deteriorates little, if at all. Ploughing-in is undertaken in December and January, and planting with early potatoes follows as soon as practicable. In addition, 13-20 cwt. per acre of a complete artificial manure (average analysis: nitrogen 6 per cent., soluble phosphate 18 per cent. and potash 5 per cent.) are usually given. Wet seaweed is often used on grass land in spring, with excellent results.

Agricultural Statistics : Appeal to Occupiers of Agricultural Land

RECENT developments in the Government's agricultural policy have made it more than ever necessary that the annual agricultural statistics collected by the Ministry of Agriculture and Fisheries should be as accurate as possible, and that the Ministry should accordingly secure returns each June from all occupiers of more than one acre of agricultural land. The Ministry has reason to believe that its list of the larger holdings is fairly complete, but that as regards the smaller holdings, particularly those in the 1-5 acre group, there is a considerable proportion of occupiers who do not receive an annual return. The Ministry, therefore, appeals to all occupiers of agricultural land of an area of more than one acre to co-operate with the Ministry to make the returns as complete as possible, more especially as it is most important that the Government should have full information regarding home production of many of the commodities—e.g., pigs, poultry, eggs, and market-garden produce—produced by occupiers of the smaller holdings.

All occupiers of more than one acre of agricultural land who have not in the past received a schedule under the Agricultural Returns Act, 1925, for completion in June, should write to the Secretary, Ministry of Agriculture and Fisheries, 7, Whitehall Place, London, S.W.1, stating the name of their holding and the parish in which it is situated. Arrangements will then be made for them to be supplied

NOTES FOR THE MONTH

with a form of return next June. Letters to the Ministry on this subject need not be stamped.

Fowl Pox and Fowl Typhoid Vaccines

THE Ministry wishes to notify poultry farmers that as and from May 1, 1934, the following reduced scale of prices will be made for issues of fowl pox vaccine in lieu of the present charge of one penny per dose, viz:—

1*d.* per dose (minimum 30 doses).

7*s.* 6*d.* per 100 doses.

70*s.* per 1,000 doses.

(The minimum of 2*s.* 6*d.*, covers a supply of 30 doses together with a scarifier and brush for applying the vaccine and full instructions for use.)

Charges on this scale will also be made for issues of fowl typhoid vaccine, the use of which has now passed the experimental stage and is proving highly efficacious.

Orders for these vaccines should be addressed to the Director, Veterinary Laboratory, Ministry of Agriculture and Fisheries, New Haw, Weybridge, Surrey, and cash should be enclosed with each order. Cheques, money and postal orders should be made payable to "The Ministry of Agriculture and Fisheries" and crossed "Bank of England."

Advisory Leaflets on Fowl Pox and Fowl Typhoid can be obtained free of charge on application to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

Colorado Beetle

THE sensational statements that have recently appeared in certain newspapers to the effect that the Colorado Beetle has suddenly spread in Essex and Kent have caused unnecessary alarm among potato growers in this country and may give an entirely unwarranted impression of the situation to countries that import potatoes from Great Britain.

There has been no spread of the pest since last autumn. The beetle hibernates underground during the winter months and does not become active until late spring or early summer; any migration during the winter is impossible. It is the case that examination of the soil in which potatoes were grown last year has revealed the presence of a few beetles on further allotments in the Tilbury-Gravesend dis-

NOTES FOR THE MONTH

strict. The soil on those allotments has been treated with carbon bi-sulphide under the Ministry's direction with the object of killing any other beetles that may have been hibernating on the sites. It will not be possible until later in the summer to make any definite statement as to the area of infestation or to determine the precise amount of success that has attended the efforts already made for the extermination of the pest.

It may, however, be stated that the methods that have been successful in discovering the beetle at Tilbury and Gravesend have been pursued further afield, and have not, so far, disclosed the presence of the insect except in the immediate neighbourhood of the places just mentioned.

The Ministry thinks it desirable also to deny a statement that it proposes to plant a belt of potatoes round the Grays and Tilbury district. The statement may have arisen from the fact that the Department's Inspectors have recently visited farms in the Tilbury-Gravesend area in order to ascertain details of the potato crops to be grown this season. This information is required in connexion with arrangements that may be made for spraying the potato crops in the area as a preventive measure against the spread of the pest.

The Eradication of Bovine Tuberculosis

WITH the object of eradicating tuberculosis, a large-scale experiment was promoted four or five years ago by the Medical Research Council, and is the subject of a report* by Dr. L. Jordan, Veterinary Pathologist to the Hannah Dairy Research Institute.

An area of about nine square miles in Ayrshire was selected for the experiment. The area was bounded by good roads and contained 37 farms. The co-operation of the owners in the district was sought and the scheme finally included 30 farms.

The general scheme was to provide the farmers with free tuberculin testing and free expert advice, on the understanding that they would attempt to eradicate tuberculosis from their herds by the adoption of methods of isolation according to the facilities their holdings afforded.

The average acreage of the farms was about 150 acres and the average number of milking cows was 26 per herd.

* *The Eradication of Bovine Tuberculosis.* By L. Jordan, Ph.D., M.R.C.V.S. Obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 2s., post free 2s. 2d.

NOTES FOR THE MONTH

All the herds in which the test was completed were self-contained, so that the necessity to purchase stock from external sources, with the risk of introducing infected animals, was reduced to a minimum.

The methods of isolation adopted in each case were based on the result of the first tuberculin test and on the facilities available for isolation. Reactors were housed separately from non-reactors wherever possible, or at different ends of the buildings where separate housing accommodation was not available, and the grazing of the reactors and non-reactors was arranged in separate fields.

The investigation was carried out over a three-year period. At the beginning of the trial, 8 herds were free from reactors; at the end, of the 30 herds, 20 were free from infection, while 8 others showed substantial reduction in the number of reactors to the tuberculin test.

At the first test in 1929, 1,475 animals in the 30 herds were tested and 385 reactors were found, an average infection of 26.1 per cent. After the second test the percentage was 25.7, and at the later tests at six-monthly intervals the percentages were 23.4, 20.3, 20.7, 15.0, and 12.3.

The report also refers to the appreciation in value of the stock among the co-operating herds. It is estimated that the valuation before the initial test was £13 13s. 4d. per head and at the final test £15 6s. 8d. per head.

Basis for Redemption of Tithe Rent Charge

THE Minister of Agriculture and Fisheries announced on April 12 that, for the purpose of the redemption of tithe rentcharge, for which application is made after April 13, 1934, until further notice, the compensation for redemption will be 30 times the net amount of the tithe rent charge after the deductions prescribed by the Tithe Acts, 1918 to 1925, have been made.

REORGANIZATION OF THE LIVE STOCK INDUSTRY

REPORT OF THE REORGANIZATION COMMISSION FOR FAT STOCK FOR ENGLAND AND WALES

THE Report of the Reorganization Commission for Fat Stock for England and Wales* has been issued by the Ministry of Agriculture and Fisheries as one of its series of "Orange Books" on agricultural marketing.

The Commission was appointed in December, 1932, under the chairmanship of Lord Bingley (then Col. the Rt. Hon. G. R. Lane-Fox), to prepare a scheme under the Agricultural Marketing Act, 1931, for regulating the marketing of fat stock and to investigate any matters affecting the operation of the scheme, particularly the manner in which the operation of the scheme might be facilitated by the regulation of imports of live stock or meat, the improvement of slaughtering facilities and the use of the provisions of the Agricultural Produce (Grading and Marking) Acts, 1928-31.

The report surveys the recent history of the meat industry and examines in some detail the seasonal variations in supplies and prices. It draws attention to the close relationship between the collapse of live stock prices since 1930 and the heavy increase in the imports of meat, and recounts the steps already taken to restore prices to a remunerative level.

The Commission's proposals are based on the continuance of the policy of import regulation, but it recommends that all imports of meat, whether in the form of fat animals, or of fresh, chilled, frozen or canned meat, and whether from foreign or Empire sources, should be regulated and that the machinery of regulation should be tightened up. With these objects in view, it suggests that negotiations with

* Report of the Reorganization Commission for Fat Stock for England and Wales, Economic Series No. 39, obtainable through any bookseller, or from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 1s. 6d. net, post free 1s. 2d.

REORGANIZATION OF THE LIVE STOCK INDUSTRY

the Dominions should be started immediately. It further recommends that imports in the autumn should be regulated with particular care so as to give the home farmer a freer market for that part of his output which has cost least to produce. The Commission sees in the regulation of imports the only means, capable of immediate application, of helping the home industry, but recognizes the possibility that the necessity of paying due regard to consumers' and other interests may involve the consideration of supplementary measures in order to restore remunerative returns to home producers, particularly in the case of beef. It suggests that of the supplementary measures that have been brought to its notice (a levy on imported meat on the lines of the Wheat Act, an import duty, a direct subsidy and an import board), the levy plan should first receive consideration by the Government.

For the purpose of regulating meat supplies, the forward contract system for the home output, which has been adopted with bacon, is regarded as both impracticable and unnecessary for other forms of live stock, but the Commission recommends a system of detailed half-yearly censuses of all live stock and quarterly forecasts of sales of stock for slaughter. It will be remembered that the Ministry undertook such a census and forecast in December last, and a further forecast has recently been made.

The problems of the marketing of store animals are in the main identical with those of marketing fat stock and in both instances the reorganization of existing methods is badly needed; the Commission has therefore prepared, under the Marketing Acts, a Scheme that is applicable to live stock generally (i.e., cattle, sheep and pigs) and not merely to fat stock. Stress is laid on the need for one scheme only for the whole of Great Britain.

The Commission considers that the producers' interests would best be served by the rationalization of the existing marketing structure and not by drastic measures involving the creation of a new system; this rationalization should be gradual and should be brought about as the Board gains experience in the working of the machine. The Commission, therefore, makes three major recommendations, viz., the limitation of the number of selling points, the codification of trade practices and the establishment of an efficient market intelligence service.

REORGANIZATION OF THE LIVE STOCK INDUSTRY

The Commission proposes that the Board, in consultation with the professional and trade interests involved (auctioneers, dealers, butchers, etc.) should approve the persons to or through whom producers could sell, and should determine the trade or professional practices which they would undertake to adopt in their transactions with producers and the information which they would supply to the Board as a condition of approval. In this way both producers and buyers would be safeguarded against an excessive number of selling points, and the Board would be in a position to encourage the most efficient channels of sale. The individual farmer would, however, still be free to utilize the channel that suited him best. The Commission considers that the method of selling fat stock by grade and dead weight is probably the most efficient, but realizes that its wider adoption is dependent upon the centralization of slaughtering facilities in suitable areas and will probably involve some measure of producer-organization. The Commission has therefore devoted considerable thought to the question of increasing the efficiency of the auction system. It is satisfied that, in some areas, dealer-purchases on the farm prevent the establishment of efficient auctions and are not in the farmers' best interests; it accordingly proposes that the Board should be given power to restrict and, if necessary, to prohibit such sales, generally or locally.

The information supplied by approved persons, coupled with a system of notification of intended sales at auction, would provide the basis for the Board's service of market intelligence, the provision of which the Commission regards as a matter of first-rate importance. This information would be supplemented by reports on conditions in the live stock and meat markets and could be published daily or at less frequent intervals for the guidance of producers, buyers and other interests. It is anticipated that the provision of really efficient market intelligence, particularly that relating to intended sales, will, of itself, go far to obviate the necessity for the Board to intervene to regulate the rate of marketing, but the Commission nevertheless recommends that the Board should have power to do so in emergency. This regulation would be effected by the Board refusing to accept entries for sale beyond a certain number, entries being accepted in order of priority. Similarly, it is anticipated that the rationalization process will avoid the risk of "rings," but, as a precaution, the Board is given power,

REORGANIZATION OF THE LIVE STOCK INDUSTRY

for use in emergency, to enter into the bidding to break the "ring."

- Producers whose pasture land does not exceed five acres, and whose sales are inconsiderable, are exempted altogether from the Scheme, while sales of pigs under the Pigs Marketing Scheme, and sales of dairy stock and such other classes of sales as the Board determine are exempted from the marketing, but not from the intelligence, provisions of the Scheme.

If producers, as a result of supply regulation, are to enjoy greater economic security, they must make active efforts to produce what the consumer wants and to keep down their production costs. It will be an important aspect of the Live Stock Marketing Board's duties to encourage and organize better methods of production, and the Report suggests various lines along which the Board might proceed. The various Marketing Boards that are being set up will provide unique opportunities for bringing to the notice of producers the latest developments in agricultural technique, and the Boards may take powers themselves to conduct education and research. As there is already in existence a national system of agricultural education and research, the Commission suggests that the time has come to consider what modifications, if any, of that system may be necessary in view of the new circumstances that are arising.

As a result of an interim recommendation of the Commission, a Committee has been set up to report upon the design and lay-out of modern factory abattoirs. The Commission now recommends the establishment of a National Slaughterhouses Commission, with advisory and planning, but not executive, powers, to co-ordinate all future plans for the erection of new abattoirs and the alteration of existing ones. New legislation is advocated to deal with the question of compensation for private slaughterhouses closed in the process of centralization.

The Report draws attention to the exceptionally high proportion of imported meat sold in London, and suggests that this is partly due to the conditions prevailing at Smithfield Market and Islington Public Abattoir. It recommends that the City Corporation should consider their reconstruction and, if possible, their amalgamation on modern lines.

The Commission supports the National Mark Beef

REORGANIZATION OF THE LIVE STOCK INDUSTRY

Scheme, and recommends its extension to new areas and the application of similar schemes to other classes of meat.

The Commission finally makes two general recommendations. The first is that the machinery and costs of distributing meat should be investigated. In spite of its importance in the national economy, there is, the Commission says, a regrettable lack of basic data as to the facts and technique of distribution, not only of meat, but also of other products; this state of affairs should be remedied, particularly in the case of food products, the primary producers of which are now rebuilding their industry on new and rationally-planned foundations. The second general recommendation is that some machinery should be set up to co-ordinate the activities of the various Marketing Boards. This machinery might take the form of a Central Council upon which each Board might have representation; the Council should not have power to over-ride the individual Marketing Boards, but should be used as a means of preventing the overlapping of functions and as a medium for the exchange of information which might also serve the purpose of anticipating and, therefore, avoiding a conflict of policy.

SOME IMPRESSIONS OF BRITISH FARMING

IV—SOUTH AND WEST.

J. A. SCOTT WATSON, M.A.,

*Sibthorpe Professor of Rural Economy, University
of Oxford.*

The Chalk-Land Problem.—There are parts of the country—for example, the Lothians and the Yorkshire Wolds—where agricultural depression is undoubtedly very acute and yet the fact does not leap to the eye. A farmer may be almost hopelessly embarrassed financially and yet his farm will quite commonly be found in first-rate order—clean, productive and fully stocked. The explanation seems to be that not only the farmer but his banker and his merchants have still faith in the land and in the system of farming, believing that care and hard work, thrift and ingenuity may still win the day.

The case is different when we turn to the great southern mass of the chalk, occupying roughly half of the four counties of Dorset, Wilts, Hampshire and Berkshire. Here, on all the poorer land—and, of course, the bulk of the chalk is poor—the evidence of distress and of decay is overwhelming. Much of the arable ground is starved and foul; work is often behindhand, and a good deal of land has been abandoned, as tillage, from motives of sheer despair and without being properly laid away to grass. Occasional farms are tenantless and the land has ceased to have any value except for shooting. Many cottages are standing empty and crumbling to ruin.

The broad fact is that here the old standard system of sheep-and-corn farming has completely broken down. This was, in its time, a remarkably successful system, 'as judged by its output in relation to the natural fertility of the land. The whole thing depended upon a certain relationship between wages on the one hand and sheep and corn prices on the other; and it seems impossible that the old relationship should ever be restored. It must not be forgotten that, even in the heyday of its prosperity, the system produced but a poor reward for the worker. In 1872—i.e., towards the end of a long period of great prosperity in arable farming—the average wage for the four

IMPRESSIONS OF BRITISH FARMING—IV

counties was only about 12s. 6d. per week. Twenty years later, when the flood of American imports had driven the price of wheat down to 23s. a quarter, wages had fallen to 10s. 6d.; a sack of corn thus still more than paid for a week's work. By 1910, when moderate prosperity had returned, wages had risen, but to no more than 13s. The system, with the intensive tillage necessary to produce the endless succession of folding crops for the sheep, employed a very large amount of labour in relation to its output, and hence a rise of the order of 150 per cent. in the wage rate, with prices falling to pre-war level, was bound to settle its fate.

It is impossible to give exact statistical information about the decay of chalk-land sheep-and-corn farming. For one thing, the four counties mainly concerned embrace a considerable variety of soils other than chalk, and on some of these the changes in farming methods have been much less striking. Again, there has been a widespread substitution of grass sheep for the old "arable" breeds, and a great deal of corn is now grown without the preliminary folding that used to be considered necessary. The following figures (for 1913 and 1932 respectively) do, however, convey some idea of the extent to which the change has gone. The statistics are totals for the four counties mentioned above. The area of vetches has been included because, in the old scheme, these formed the most important of the summer folding crops.

[Thousands of Acres.]			
	1913.	1932.	Loss, per cent.
All grain crops	458	306	36
Roots (turnips, swedes and mangolds)	158	73	54
Vetches	31	12.7	59
[Thousands.]			
Breeding ewes	488	318	35
Total sheep	1,080	699	35

Another unfortunate aspect of the change is the great decline in employment. In the same period of nineteen years, the total number of persons employed has fallen from 67,000 to 51,000, or by more than 25 per cent. As might have been expected, the loss has fallen most heavily upon the younger classes of workers, the number of lads under 21 having dropped by no less than 43 per cent.

The search for alternative methods of farming is of course going on continually, and numbers of farmers have reached

IMPRESSIONS OF BRITISH FARMING—IV

at least a partial solution of their particular problems—i.e., they have found ways and means of reducing their losses. In some instances there has been no change that could be called fundamental, but only a series of modifications designed mainly to save labour and to cut down the cake-bill, these being the two largest items on the expenditure side of the account. The "arable" flock may be still in existence, only reduced in numbers and probably more completely specialized for early-fat-lamb production. The loss of manure, due to the diminished numbers of the flock, is made good by heavier applications of artificials. The decline in the root acreage is compensated, as far as weed control is concerned, by an increase in the area of bare or bastard fallow. Finally, there has been a widespread partial displacement of horses by tractors.

Of the more revolutionary changes the commonest has been to grass down rather extensively and to introduce a dairy herd. Where farms were large, or buildings incapable of adaptation, the open-air system has often been adopted, and quite generally with success. The output of milk per cow on this system is of course low, but the output per acre is often satisfactory in relation to the quality of the land, and the output per man is very high. Dairying has made great progress, the number of cows having risen by 33 per cent. since the pre-war year. The movement would undoubtedly make still further progress but for the growing problem of surplus milk.

The conversion of the old arable into dairy pastures has often been surprisingly successful, but some of the soil is too thin and poor for the purpose. In such instances, whole farms, or large parts of them, have been turned into sheep runs (which is doubtless what they were a hundred years ago) and stocked with hardy breeds like the Welsh and the Cheviot. This change has had, necessarily, a disastrous effect both on output and on employment; yet it is, from any point of view, preferable to the alternative of turning the land over to rabbits.

Finally, there is now a considerable number of completely mechanized corn farms, some of them without live stock, and others with sheep and cattle running upon the ley which alternates with the corn. There is, in fact, one example of continuous corn growing, without live stock, that goes back for many years before the tractor era. Clearly, if the cropping is to be reduced to corn and

IMPRESSIONS OF BRITISH FARMING—IV

“ seeds,” or to corn only, there is now every argument for mechanization.

It is probably true, at least of the typical thin chalk land, that yields will not be maintained at their old level without the sheep fold; but the saving in costs may very likely compensate, and more, for the lower output.

One feature is common to practically all these new types of organization—namely, that they involve drastic reductions in the number of men employed. The increase in pig and poultry keeping has done something to counteract this tendency, and here and there are to be found farms that, by developing these branches and also running dairy herds, are providing jobs for nearly the old number of workers. Speaking generally, however, it would seem that there is no way of providing the old amount of employment at the new wage-level.

Small Farms in the Far West.—To try to account for the contrasts that exist between one part of rural England and another is an exercise that provides endless interest. Some of the differences are of course easily to be explained by the variety of soil and climatic conditions, or by the relative accessibility of markets. Thus, it is easy to see why Norfolk should grow barley and Cheshire should keep dairy cows. Other differences bear little relation either to natural or to modern economic conditions, and we must seek for their explanation in past history—sometimes even in the immemorial customs of the original settlers.

There are many contrasts between the south Midlands, on the one hand, and Devon, Cornwall and Wales on the other. In the Midlands there are still abundant visible signs of Saxon settlement. There are the old Saxon villages, often tucked away out of sight in the valleys, so that the landscape has a characteristic appearance of desertion. There are wide stretches of unenclosed land, the remains, in many cases, of the great common fields. The farms run very large; in the four counties last described, for example, nearly half the land is in holdings that exceed 300 acres in extent. Family farms are the exception, having disappeared largely as a result of Parliamentary enclosure. Again, it may be said that until lately the emphasis of the farming was always upon corn, and live stock took second place.

Whenever we leave the Midland block, however, either north-westward into Cheshire and Lancashire, or across the

IMPRESSIONS OF BRITISH FARMING—IV

Severn Valley into Wales, or south-west into Devon and Cornwall, we get the same kind of change. The Saxon village disappears, and the countryside is dotted with separate little homesteads. The fields are small—often inconveniently so—and the fences have obviously been put up long ago, and were meant to remain—consisting often of earthen banks containing many tons of material to the yard. Moreover, the farms have in the main remained small, for there were here no Enclosure Acts to disrupt the old system of division. Thus, in Devon less than 10 per cent. of the land is in farms of the largest class (over 300 acres), and in Cornwall and Wales less than 5 per cent. The family farm is typical. Finally, the emphasis of the farming is upon live stock rather than on arable crops. Alternate husbandry—the use of the long ley—is universal and, paradoxical as it may seem, is far older than the practice of sowing grass-seeds. The primitive system of farming here was not the three-field system, but a form of the world-wide “shifting agriculture”; that is to say, a piece of land was broken up out of turf, cropped to exhaustion and then allowed to fall down again to grass.

Recent years have seen a great decline in tillage all over the West Country. The change has been quickly and easily made—as also, for instance, in Northumberland—by the simple expedient of letting the leys lie for longer and longer periods. Meanwhile the numbers of stock (except, of course, horses) have steadily grown. The increase in cattle and in poultry is general, while Cornwall, for example, has doubled its number of pigs in twenty years, and Wales has added nearly 25 per cent. to her sheep flocks in the same period.

The agricultural depression, in its earlier phases, touched the West Country but lightly. The family farmer, in any event, is not subject to the extreme ups and downs of the man with the big wage bill. Moreover, the interest in corn-growing was never large, and was very quickly reduced. Then, too, although local industries like tin- and clay-mining in Cornwall, or coal and steel in South Wales, have suffered their full measure of misfortune, there has been since the War a great increase in the numbers of summer visitors, who have not only provided a market for dairy produce, vegetables, eggs and the like, but have given many farmers' wives the chance to turn their houses into money-making departments of the farm. The number of farms

IMPRESSIONS OF BRITISH FARMING—IV

in Devon and Cornwall that offer accommodation to the holiday-maker is very large, and the income from this source must be considerable.

It does not, however, need to be said that anybody who has been trying, in recent years, to make his rent by selling butter or by rearing store cattle has had a losing battle to fight, and there can be little doubt that distress is now widespread.

There are several details about Cornish farming that are worth passing mention. It is believed here that, where the object of corn-growing is to produce stock food, the most satisfactory crop is dredge corn, a mixture of oats and barley. This crop has been grown as far back as records go, but its importance relatively to the other grain crops is increasing. Thus, while the acreage of pure cereals has greatly declined since the end of the War, that of dredge corn has been maintained at about 40,000 acres, which now represents fully 40 per cent. of the total cereal acreage. The argument in favour of the crop is that the yield is higher than that of either component grown alone.

There is a large proportion of poor land in the county, but where good soil is found near the sea, and with a suitable slope and exposure, the cultivation reaches a level of intensity hardly met with elsewhere in this country. The best of the land is double cropped, sometimes year after year. It produces first-early potatoes, which are commonly marketed in late May and early June, and afterwards a crop of broccoli. The best patches of such land command a rent of the order of £10 per acre.

Round Land's End, which is a small-holdings district of not very fertile-looking land, there is a remarkably solid colony of pure-bred Guernsey cattle. Indeed, a cow of any other breed is quite exceptional. It is pleasant to find a body of hard-working small men reaping an adequate reward for their enterprise in breeding, for of course the Guernsey has enjoyed a good many years of almost boom demand, and surplus stock has brought in very good money.

The most recent development in the way of exploiting the Cornish climate is the erection of numbers of unheated greenhouses for the production of early spring flowers. There is also, of course, outdoor cultivation of daffodils, but the outside crop comes later than that from the Scillies, and after the edge has been taken off the demand. There

IMPRESSIONS OF BRITISH FARMING—IV

seems little reason to doubt that the market for flowers, in common with that for many other luxury articles, will rapidly expand.

The Cider Industry.—It is a very exceptional thing, in these times, to find, either at home or abroad, any branch of the agricultural industry flourishing and growing without some form of protection or artificial assistance. The state of the cider industry is therefore worthy of special remark.

The market for cider is expanding rapidly, partly perhaps on account of the high taxation of malt liquors and wine, but largely, too, owing to the great efforts that have been made by the industry itself to improve the quality of the beverage and the methods of marketing. Somerset, Hereford and Devon are the counties chiefly concerned, each having about 20,000 acres of orchard land with a high proportion of cider apples.

The industry used to be largely conducted on the farms, and a large proportion of the output was for local consumption. Little trouble was taken to produce a high-grade product or to standardize the quality. An important step has been to transfer the manufacture to large-scale factories and to bring it under proper scientific control. The Research Station at Long Ashton has been of great service in sorting out and classifying the really valuable among the innumerable local varieties of fruit, and also by ensuring supplies of trees that are true to name. A great deal of work has been done there also at the manufacturing end—e.g., by working out the proper blends and by showing how to control fermentation. The manufacturers, in turn, have undertaken to supply, at special rates, trees of the kinds chiefly required, and they have guaranteed a price for future supplies of apples. Standard types of cider, with varying qualities to suit all tastes, have been placed on the market, and a large proportion is sold under the National Mark. With the supply of home-grown fruit still short of the demand and with every prospect of the demand rising, it would appear that the business has a long era of prosperity before it.

POTATO DISEASES*

G. H. PETHYBRIDGE, B.Sc., Ph.D.,

Plant Pathological Laboratory, Ministry of Agriculture.

THERE are so many specific diseases of the potato plant, due to parasitic fungi and bacteria, as well as to viruses—to say nothing of depredations due to insects and other animals, and of maladies resulting from non-parasitic agencies—that it is quite impossible to do more than consider a very restricted number of them here. It must not be supposed, however, that those perforce omitted are of no importance, for many of them may cause serious trouble and loss, especially in particular localities or under certain special conditions of soil, weather, or other circumstances that influence the crop.

Just now many farmers will naturally be concerned with the seed potatoes they propose to plant this season, although the best of them will have paid attention to this matter long ago, and will already have their seed boxed and placed under suitable conditions for sprouting. Such boxing and sprouting of seed potatoes is advantageous, not alone from the points of view of increased freedom in the choice of actual planting time and ultimate gain in yield, but also because the practice offers a substantial safeguard against the planting of diseased seed. Tubers that are affected with Blight and still retain any viable eyes will sprout considerably earlier than others, and can thus be recognized and eliminated; for blighted tubers are the primary source from which epidemics of Blight arise in the crop.

Tubers affected with Dry Rot, a disease particularly common in early varieties, and recognizable by the concentrically wrinkled sunken areas on the skin from which protrude dirty white or bluish pustules, composed of myriads of fungus spores, can also be removed. They should be destroyed by burning, for they constitute "infection centres" from which disease may be transmitted to healthy tubers. It has been proved to be useless to cut out the diseased portions from a tuber affected with

* Paper substantially as read at a Conference on "Problems of Potato Growing," held at the Rothamsted Experimental Station, Harpenden, on Tuesday, February 20, 1934. The full Report of the Conference has now been published and copies, price 2s. each, can be obtained from the Experimental Station.

POTATO DISEASES

Dry Rot and plant the remainder, for it subsequently decays in the soil. It is also dangerous; for, if the healthy tubers in the same lot are cut into sets, the knife or hands will readily carry infection to them, and the result of planting them will be "misses." The Dry Rot fungus is a wound parasite, and one cannot take too much care (especially with early varieties) to avoid mechanical damage to the tubers, both whilst lifting the crop and during its subsequent handling and transport.

Too often it appears to be forgotten that potato tubers are living things; as such they deserve, but do not always get, better treatment than is meted out to such commodities as coal, gravel, manures, and so forth. They require air for breathing purposes, and to fill up a closed and unventilated store to the very top with bags of them, as occurred in a case recently investigated, is simply asking for trouble. They must not be exposed to low temperatures or they will be killed, and will subsequently rot without the intervention of any parasitic organism. Nor must they become overheated, or they will also be killed and afterwards rot; or, if the temperature is not sufficiently high for that, become affected with Black Heart. Matters of this kind may appear trivial and relatively unimportant; but, judging from the number of complaints arising from such ill-treatment that have been referred to us in recent years, there certainly does seem to be considerable room for improvement in the way seed potatoes are treated. If they could be regarded as being almost as delicate as fruit or eggs, it would not be amiss.

Potatoes substantially attacked by Common Scab, particularly if the eyes are involved, will not be used for seed by good growers, nor will such as are affected with Powdery Scab. These two diseases are also contracted from the soil, and it is well to remember that even healthy seed planted in soil contaminated with either of the two Scab-producing organisms is apt to yield an affected crop of tubers, and particularly so if the soil has recently been limed. Seed potatoes showing the sclerotial incrustations of the Black Scurf fungus should also be looked on with disfavour. True, this ubiquitous fungus is very often present in potato land, but it is advisable not to augment it there. The blemish produced by the fungus on the surface of the new tubers is the least important of its maleficent effects. It

POTATO DISEASES

is one of the more important causes of "misses" or gaps in the crop. When cold, wet conditions prevail after planting, the Black Scurf fungus readily attacks the tips of the young sprouts underground, and kills them. The further young growth that follows as a reaction to such attack is in turn destroyed; and thus nothing in the shape of a shoot may come above ground. On the other hand, even if young shoots do succeed in coming up, they not infrequently become cankered through by the fungus a few inches below soil level, and then wilt and die away. Trouble of this kind is most frequent in land that has carried crops of potatoes in succession for a considerable period, and in which, naturally, cumulative disease effects are to be expected. The remedy is obvious, but too often neglected.

Skin Spot is a disease that needs special attention, for it has caused a great deal of trouble in recent years. It can be recognized on a tuber in the form of small, circular, dark spots on the skin, usually having a slightly raised, minute pimple in the centre. Often the spots are very numerous and confluent, giving a pock-like appearance to the skin. In ware tubers, Skin Spot, though objectionable, might, perhaps, be regarded more as a blemish than as a serious disease, for the fungus that causes it (*Oospora pustulans*) does not penetrate to any considerable depth into the tissue of the tuber, and is completely removed on ordinary peeling. With seed tubers, however, the matter is very different. The fungus attacks the individual buds in the eyes and kills them. The severity of attack appears to depend largely on external conditions. Even during winter storage the buds may be killed to some extent, but, fortunately, the potato has the capacity (not unlimited, it is true) of forming new buds in its eyes to replace those lost. The struggle between host and parasite does not cease when the tuber is planted. If the soil is in good condition and the weather and other circumstances are favourable to the potato, then the unattacked buds will soon become large enough and sufficiently robust to resist attack by the fungus. On the other hand, when the soil is ill drained and not well tilled, and particularly when cold, wet weather conditions prevail for any length of time after planting, the fungus gains the upper hand, kills bud after bud as they successively arise, until the tuber may eventually become entirely "blind." It then produces nothing

POTATO DISEASES

above ground, of course, but it is not actually dead. Unless attacked by some other enemy, the blind tuber produces at its heel end, where it was originally attached to its stolon, a rather hard, woody, tumour-like growth. Blind seed tubers, each with a basal tumour of this kind, are not infrequently found at digging time in a gappy crop derived from seed affected with Skin Spot, and the tumours have sometimes been wrongly suspected as having been caused by the Wart Disease organism. They are still alive, so reluctant is the potato to die; and if they are replanted under favourable conditions, adventitious buds are formed on the tumours, and develop into normal foliage-bearing shoots. Seed potatoes showing Skin Spot, therefore, should be regarded with great suspicion. Under unfavourable conditions they are almost certain to give rise to real trouble, and no one can predict with certainty what conditions are likely to prevail after planting. The conditions existing when seed potatoes are properly sprouted in boxes are advantageous to the potato and not to the Skin Spot fungus. If, therefore, sprouting seed potatoes were a universal practice less would be heard of failures of crops due to this disease.

What has been said so far in regard to troubles that may arise from faulty seed potatoes refers to matters that are discernible by careful examination of the tubers. Unfortunately some other diseases transmitted with seed potatoes afford no signs whatever of their presence; and the chief of these are most of the virus diseases. In practice, judging from reports received, the most important of these from the point of view of general reduction in yield is Leaf Roll. Mosaic and Crinkle probably come next, and the various forms of Streak last. This order, however, does not represent the relative virulence with which these diseases attack potato plants themselves, for Streak and the severe forms of Crinkle may be so intense in their effects that the affected plants may be practically wiped out, and thus few or no tubers remain that could find their way into commerce as seed.

The nature of plant viruses is still an unsolved problem, but it is unquestionable that those affecting the potato are carried in the seed tuber and that they are transmitted from diseased to healthy plants by insects. Fortunately, however, they do not appear to be carried in the true seed,

POTATO DISEASES

developed in the so-called potato " plum " or " apple "; and thus the production of virus-free potatoes, for breeding or other purposes, is not an impossibility.

Attempts have been made from time to time to find a ready method of distinguishing between healthy seed potatoes and those derived from virus-attacked plants, but so far without much practical success. In the United States of America a so-called " tuber-index " method of testing seed potatoes for the presence or absence of virus has been developed and practised to some extent. This consists in removing a portion of the tuber containing an eye, planting it in a greenhouse in the winter and noting the state of health of the shoots when they are some eight inches or so high. Those tubers alone are retained for planting the portions from which have given rise to shoots showing no virus symptoms; and from them relatively healthy stocks can be worked up, provided this is done under isolated conditions, where virus infection from without is not possible or is at a minimum. No doubt this method of controlling health is valuable for raising special stocks of seed potatoes, and particularly so if, as seems to be the case in America, the tuber-indexing can be done for the raiser by a public institution. For the ordinary farmer, however, the method is scarcely practicable.

Attempts have been made recently in Germany to discriminate between healthy and degenerate (i.e., presumably, virus-containing) potato tubers by electrical measurement methods. Arising out of these a so-called copper-strip test has been devised. A bright strip of copper about the size of a penknife blade is pushed well into the end of the tuber, which is then kept for about eight hours at a temperature of 37° - 40° C. After a further sixteen hours at about 20° C., the tuber is cut across. If it is a healthy one there should be a black stain extending for a considerable distance around the slit-like wound made by the copper strip. If it is a degenerate one there should be no such stain, or at most one not extending much beyond the edges of the wound itself. The method seemed so simple as to be worth a trial, hence one was made with tubers known to be derived from plants affected with Leaf Roll and with others that were believed to be healthy. The result, however, was that the tubers affected with Leaf Roll showed the extensive blackening supposed to occur only with healthy tubers;

POTATO DISEASES

thus, for this particular disease, at any rate, the method appears to be useless. Others have made similar preliminary tests and have also found the method not promising for distinguishing tubers containing virus from healthy tubers.

For the supply of seed potatoes as free as may be from viruses, the farmer therefore has to rely on the good faith of the seed producer, and in recent years much has been done (though much more remains to be accomplished) to raise the standard of health (particularly in regard to virus diseases) of crops of potatoes grown for seed. In Scotland, for example, growing crops showing more than a certain proportion of virus diseases, even if one hundred per cent. pure (i.e., true to name), are now no longer awarded official certificates for seed purposes. That really first-class seed potatoes, carrying a bare minimum of virus disease, can be raised, has clearly been shown by the successful work done in the last few years at University College, Bangor, North Wales, an account of which will be found in the Ministry's JOURNAL for July, 1933. In principle the plan is to start with a small quantity (in some instances, perhaps, a single plant or tuber) of material that is virus-free, or as near to this ideal as can humanly be attained, and to multiply it under rigid conditions that preclude infection (brought by insect vectors) from outside sources. In practice, procedure may be slow and difficult at first, but it can certainly be done.

The temptation to dwell disproportionately on virus diseases of the potato is extremely strong, and must be resisted, and consideration must now be given to one or two other diseases concerned with the growing plant in the field and affecting the crop of tubers raised. Blight (due to *Phytophthora infestans*) is still by far the most important of all potato diseases in this country, for it destroys the tops, reduces the crop yield and rots many of the tubers produced. Time will not permit of any detailed account of the disease now, and most of you will be thoroughly familiar with the subject. Two matters only, therefore, will be touched on here, namely, the occurrence of primary outbreaks and Blight resistance. It used to be supposed that the first outbreaks of Blight each season always occurred in the extreme south-west of the country; that in due course infection spread from them eastwards and northwards, in

POTATO DISEASES

wave-like fashion, the rate of progression of the wave depending largely on weather conditions. For the past ten years or so records have been kept of the dates and localities of the first seasonal outbreaks of potato Blight, and they show that this wave of disease does not in fact exist. Although, of course, mainly owing to climatic conditions, the very earliest outbreaks generally do occur in the south-west and the latest in the north, yet, broadly speaking, outbreaks occur at numerous centres widely distant from one another and at no very widely different dates. A single stone thrown into the water at the edge of a pond will produce a wave (or a succession of parallel waves) that will progress until it reaches the edges and far end of the pond, the whole surface having been traversed from the one original source of disturbance. If a handful of pebbles is broadcast into the pond, however, each will give rise to a circular wave; and these circles will expand and run into one another until eventually the whole of the surface of the pond will have been wave-traversed. If the whole handful is scattered not at one time, but distributed bit by bit, at comparatively short intervals of time, the whole surface will also eventually be wave-traversed; and this is the kind of picture to bear in mind when considering the seasonal inception and spread of potato Blight here.

The practical bearing of this analogy is that when a farmer hears that Blight has once more put in its annual appearance somewhere in the country he should not wait for the advance of any wave of disease from a distance, but realize that it may be practically at his own door already and act accordingly. Each season, as soon as potato Blight has occurred again, in whatever locality, the Ministry of Agriculture makes the fact known as widely as possible through the Press and by other methods of publicity. The warning is repeated as further outbreaks are reported, and thus farmers are reminded that the time has arrived when spraying potatoes with Bordeaux or with Burgundy mixture should be undertaken.

One point in connexion with the records deserves to be mentioned. It is the comparative frequency with which the first outbreaks occur in proximity to old potato pits or clamps. It is known, of course, that the Blight fungus overwinters in the tubers, and, it is believed, in them alone.

POTATO DISEASES

Blighted tubers thrown out of a pit and left lying about are naturally dangerous sources of infection to neighbouring potato crops, for the fungus fructifies on them, and the spores produced are readily disseminated. Much could be done to retard and minimize outbreaks of Blight by paying stricter attention to plant sanitation and hygiene and thus suppressing foci from which primary infections arise. Moreover, more than is often attempted could be done to minimize attacks of Blight on the tubers by adequate and careful earthing up of the drills.

A potato variety resistant to or immune from Blight attack has for generations been a desideratum, and many attempts have been made to secure one. Nor have they been entirely unsuccessful, for a few varieties resistant both in haulm and tuber do exist. Unfortunately, they do not possess many of the other important characteristics that are bound up with a commercially valuable sort, and they have therefore not come into general favour. Some of them are late-ripening varieties, but one of them at least is an early one, and their resistance cannot be explained (as is sometimes supposed) by the assumption that they merely escape infection because they are not in a suitable stage of development for attack when the Blight fungus is active. Their resistance appears to be constitutional or inherent. Renewed attempts have been made during the past ten or twelve years, particularly in Germany, to raise a Blight-resistant variety that will be satisfactory from other points of view, and acceptable to the commercial potato grower. Failure to produce such a variety by breeding from already cultivated varieties alone led to the use by breeders of one or two highly-resistant wild species of potatoes, as parents, in crosses with cultivated varieties. A few new varieties were thus raised possessing, apparently, resistance and many or most of the other required characteristics, and the prospects seemed particularly good. Alas, when these varieties were sent out, after a few years, for wider trial, they broke down, and became attacked by Blight. This happened successively with two sets of specially promising progenies, but there still remains a third set not yet fully tried out. The resistant wild species *Solanum demissum* is concerned in the derivation of this third lot, but there appears to be no obvious reason why the progenies raised from it should ultimately behave differently from those raised with the help of other resistant wild species.

POTATO DISEASES

Such disasters are of course almost heart-breaking to the breeder, and the question is:—How do they come about? The answer is that it is now thought that the Blight fungus exists in the form of more than one "biological species" (just as the Rust fungi do), and that a variety resistant to one biological species may be attacked by a different one. Further and very critical work is required before this belief can be regarded as based on an unshakable foundation; but if it should prove to stand fast, then the breeder's task is made a hundredfold more difficult; for a variety will have to be raised that resists the attack not only of those "biological species" of *Phytophthora infestans* that already exist, but also of others that may possibly come into existence in future.

There is another important aspect of the Blight resistance problem that may be alluded to in passing. It is the question as to whether resistance, even if it appears to be inherent or constitutional, is necessarily really permanent in the variety. Can external factors so influence the potato plant that Blight resistance becomes weakened or even entirely lost in the course of years when the variety comes into general cultivation? The scientific breeder will probably answer no, if resistance is really bound up with the gene (the supposed material unit of the cell that carries the heritable characteristics of the plant), and seeing that propagation is entirely vegetative; but it will be up to him to demonstrate beyond doubt that Blight resistance is or can be so linked up and remain absolutely permanent.

It may now be well to turn from this perhaps somewhat depressing picture of Blight-resistance and its practical possibilities to that of resistance to a totally different disease, a picture of a much more cheerful and satisfactory aspect, namely, resistance to Wart Disease. Here it can be said that the existence of some old and the raising of certain new resistant varieties has been of immense practical importance to the farmer. Thanks to them and to the administrative measures governing their employment the losses due to this disease in this country are now entirely negligible, although discovered foci of soil infection have not ceased to accumulate slowly. This satisfactory state of affairs, however, must not lead to diminished care or to neglect of the precautions that have led to this happy result, for the

POTATO DISEASES

menace still remains. The careful work of recent years has shown that potato varieties can be arranged in a series, starting with those that are extremely susceptible to Wart attack, passing through those that are less susceptible to some that are somewhat resistant; then to others definitely resistant, highly resistant, almost immune and apparently actually immune, in turn. By the use of these immune and very highly resistant varieties for planting in infected land normal crops can be grown, in spite of the fact that the parasite is still there and may remain in viable condition there for a great number of years. When breeders succeed, as no doubt eventually they will do, in producing highly-resistant or immune first-early varieties to replace the susceptible ones still necessarily grown in their absence, and when highly-resistant or immune substitutes for such valuable maincrop varieties as King Edward become available, then Wart Disease will become a matter of secondary importance. Immunity and resistance here do seem to be a permanent feature of the variety; at any rate, no authentic case of breakdown has yet been known to occur. Time and further experience alone can determine whether such a thing is possible.

To those who may have studied the historical aspects of this disease it will be of interest to mention that further light has been shed on its early history in this country by investigations recently made in Finland. There is circumstantial evidence that the disease had existed in England for some few years before 1900, when its presence and nature were first recognized by Professor Potter (*Jour. Board Agric.*, 9, 1902-3, p. 320). It was evidently seen here (and illustrated, though not correctly identified) in 1898 by G. Abbey (*Jour. Hortic. Cott. Gard. and Home Farmer*, 3 Ser., 37, 1898, p. 463) and by A. Sutton (*Jour. Roy. Agric. Soc.*, 3 Ser., 9, 1898, p. 598). It was also probably seen, but not specifically recognized, in the same year by William G. Smith (*Jour. Roy. Hortic. Soc.*, Vol. 22, 1898-99, clxxvi and clxxviii). These are our earliest definite records.* It was first described and recognized as a new disease, in 1896, in Hungary, by K. Schilberszky (*Ber. Deut. Bot. Ges.*, 14.

* Since the above was written, a slightly earlier record has come to light. It is clear, from the description given in an answer to a correspondent of *The Gardeners' Chronicle* (Vol. 30, Aug. 22, 1896, p. 227), that certain potatoes showing warty growths, submitted to the Editor, must have been affected with Wart Disease. Both M. C. Cooke and Worthington G. Smith, well-known mycologists, examined the specimens and agreed that this manifestation was a novelty.

POTATO DISEASES

1896, p. 36). Now, A. Hilli, writing in 1932 (*Perunasyövän (Synchytrium endobioticum [Schilb.] Perc.) leviämisen syistä suomessa jo ulkomailla, Helsinki, 1932, p. 64*) brings forward substantial evidence to show that Wart Disease was introduced into Finland with a consignment of Magnum Bonum potatoes from England in the year 1893. That would be five years before the disease was recognized in this country and three years before it had been discovered and described in any country. How long it may have been here before 1893 no one can say, but had we possessed a phytopathological service in this country forty years ago, how much trouble might have been avoided!

Finally, although, strictly speaking, insect pests do not come within my special province, but are dealt with by my entomological colleagues, something must be said about the existing Colorado beetle menace to this country. It is scarcely necessary to emphasize the enormous damage that this insect and its grubs can do to potato crops by devouring the tops; this is well known. In general shape and appearance the beetle reminds one of a ladybird beetle, but it is from two to three times larger than our commoner ladybirds, and instead of having black spots on its back, it has ten black stripes running lengthwise. In colour it is a light yellowish-brown, and the soft grubs are reddish. During the last decade this pest, previously confined to North America, has become well established in France, and each year it has migrated further north in that country until now it is not far from the Channel coast. All possible practical precautions are being taken to keep the pest out of England, but an isolated case involving a few beetles was discovered last August at Tilbury. Full particulars concerning this will be found in an article by Mr. J. C. F. Fryer, Director of the Ministry's Plant Pathological Laboratory, Harpenden, who is in chief command of operations against the pest. This was published in the Ministry's JOURNAL for January last, and in addition, an Advisory Leaflet (No. 71) on the subject, with a coloured plate, was published in the same month. A copy of this should be in the hands of every potato grower. Once before, over thirty years ago, this pest was found here; curiously enough, also at Tilbury. It was then successfully eradicated and it is hoped and believed that the same success will crown the present efforts at extermination. However, the beetle has now become established so very much nearer

POTATO DISEASES

to our shores than it was formerly that it is necessary to be more than ever on the alert in order to detect immediately any fresh invasion. Promptness of detection is essential for swift suppression. Operations against this pest can successfully be conducted only with the active assistance and co-operation of farmers and other occupiers of land. This has so far been most willingly given and will no doubt be as readily continued. Suspected specimens should be sent, packed as carefully as possible to avoid damage in the post, to The Secretary, Ministry of Agriculture, 10, Whitehall Place, London, S.W.1. On packets sent by letter post thus addressed postage need not be prepaid.

THE COMPOSITION AND FEEDING VALUE OF LUCERNE

H. E. WOODMAN, M.A., Ph.D., D.Sc.,
School of Agriculture, Cambridge.

A DROUGHTY summer such as that experienced in 1933 serves strongly to focus attention on the important rôle played by forage crops in British animal husbandry. Bare, scorched pastures were an all too common sight during the summer period of acute water scarcity, and farmers found the problem of maintaining the level of milk yield in the dairy herd more difficult than usual. With dairy cows on such scanty pasturage, however, serious decline of milk yield may be prevented by feeding the succulent food provided by forage crops, the latter usually having the advantage of being able to continue green and flourishing in those difficult periods when drought has reduced the productivity of pasture to a very low level.

Amongst such drought-resisting forage crops, lucerne enjoys a special reputation. Yet, despite the prominence that has been given to the merits of this crop in recent years, the response of the farmer in this country has, for one reason or another, been anything but enthusiastic. Nevertheless, a definite, although slight, increase in the acreage under lucerne has occurred in the past few years, the acreage so utilized in England and Wales having increased from 37,104 acres in 1928 to 46,120 acres in 1931. It is of interest to note that nearly 70 per cent. of this lucerne acreage is contributed by the south-eastern counties, where this crop has been grown since its introduction in the 17th century.^{(1)*}

A new factor that has arisen in English rural life, however, may lead to a big increase in the acreage devoted to the lucerne crop. This is the recent establishment in this country of the American practice of drying lucerne by artificial means and grinding the dried produce to a meal. Lucerne meal made in this way has already acquired considerable popularity as an ingredient of poultry foods, and its possible uses in other directions are of interest alike to practical and scientific men. If this new development makes headway, it is obvious that very large areas of this

* For references, see page 150.

COMPOSITION AND FEEDING VALUE OF LUCERNE

leguminous crop will have to be grown to serve the needs of the industry.

In this connexion it is desirable to point out that if the artificial drying of young grass for use as a concentrate in winter feeding is to be placed on a commercial footing, as has been suggested on the basis of the Cambridge pasture investigations, it would be an advantage if this process were to go hand in hand with lucerne drying, since such a combination of interests would constitute an insurance against a possible uneconomical working of the drying plant in seasons when grass is relatively scarce as a consequence of drought.

In view of the commercial significance of lucerne, and of the manner in which the crop fits into the British system of grassland husbandry, it is perhaps surprising that little work of a scientific nature has been done by the nutritional investigator in this country on lucerne (or on any of the other forage crops), and that farmers have been content to rely on their own experience supplemented by the somewhat meagre and frequently unsatisfactory information derived from foreign sources. With the object of filling in this gap in nutritional knowledge, it was decided to undertake at Cambridge a systematic investigation into the nutritive properties of the lucerne crop, and it is the purpose of the present article to give some account of the results that were obtained in the first season of the investigation (1932). Although it may be unwise to emphasize too strongly the conclusions drawn from the findings of a single year's work, yet it may be stated that the main results have been entirely substantiated by further work in 1933, and it is considered desirable, even at this early stage, to bring the results to the notice both of the farmer and of the agricultural engineer concerned with the development of the lucerne-drying industry.

Composition of Lucerne.—Four separate crops of lucerne, situated in different localities in East Anglia, were investigated, from the standpoints of yield, composition and feeding value, during 1932. The results for the several crops displayed, on the main points, a good degree of harmony, and no attempt need therefore be made in this article to summarize the whole of the data that were accumulated. It will be sufficient, for example, in order to gain an insight into the composition of lucerne and to illustrate how this changes as the plant passes through its

COMPOSITION AND FEEDING VALUE OF LUCERNE

different stages of growth, to cite the results obtained from a four-year-old stand of lucerne (variety Provence) growing on the Howe Hill University Farm at Cambridge. The essential figures, expressed on the basis of dry matter, are recorded in Table I.

TABLE I.—COMPOSITION, ON THE BASIS OF DRY MATTER, OF SAMPLES OF FIRST-GROWTH LUCERNE FROM HOWE HILL, CAMBRIDGE, 1932. SHOWING PROGRESSIVE CHANGES FROM AN EARLY STAGE OF GROWTH UP TO FULL-FLOWERING.

Stage of growth	Pre-budding period					Budding period		Flowering period	
No. of sample	1	2	3	4	5	6	7	8	9
Digestion period							1		2
Date of cutting	April 25	May 5	May 13	May 19	May 28	June 3	June 7-17	June 28	July 2-11
	%	%	%	%	%	%	%	%	%
Crude protein	34.97	33.44	31.78	30.50	23.09	22.76	20.43	16.16	17.39
Crude oil	3.33	3.16	2.87	3.01	2.36	3.10	2.61	2.99	2.09
Carbohydrate	35.65	38.52	37.49	37.69	41.15	39.56	42.22	41.07	39.35
Crude fibre	13.73	14.44	17.19	17.84	24.29	25.41	23.93	29.24	29.72
Ash	12.32	10.44	10.67	10.96	9.11	9.17	10.81	10.54	11.45
True protein	25.60	24.43	24.08	23.19	17.86	16.87	16.18	12.86	13.53
"Amides"	9.37	9.01	7.70	7.31	5.23	5.89	4.25	3.30	3.86
SiO ₂ -free ash	10.48	10.02	10.07	10.77	8.90	9.12	10.67	10.44	11.17
Lime (CaO)	3.07	3.04	3.05	3.69	3.32	3.55	4.35	4.76	4.91
Phosphoric acid (P ₂ O ₅)	1.44	1.49	1.29	1.34	0.99	0.95	0.89	0.66	0.68
Potash (K ₂ O)	2.63	2.35	2.15	2.13	1.33	1.33	1.18	0.85	0.93
Soda (Na ₂ O)	0.25	0.24	0.11	0.12	0.19	0.23	0.29	0.40	0.42
Chlorine (Cl ₂)	0.60	0.61	0.66	0.63	0.41	0.42	0.47	0.44	0.63
Total sulphur	0.49	0.54	0.63	0.54	0.63	0.66	0.43	0.59	0.40
Inorganic sulphur	0.15	0.19	0.21	0.17	0.20	0.16	0.20	0.11	0.17
Organic sulphur	0.34	0.35	0.42	0.37	0.43	0.50	0.23	0.48	0.23
Dry matter as cut	17.61	15.04	14.75	14.17	14.98	18.83	20.52	25.53	22.60

Sample 1. Average height of plants, 3-5 in. No superficial moisture when cut.

Sample 2. " " 8-10 in.

Sample 3. " " 10-12 in. Contained superficial moisture when cut.

Sample 4. " " 12-14 in.

Sample 5. " " 20-24 in.

Sample 6. " " 22-24 in. No superficial moisture when cut.

Sample 7. Budding stage (digestion period 1).

Sample 8. Early flowering stage. No superficial moisture when cut.

Sample 9. Flowering stage (digestion period 2).

Moisture Content of Lucerne.—The moisture content of budding or flowering lucerne is usually in the neighbourhood of 78-80 per cent. In times of drought, however, it may fall as low as 65 per cent. During the drought of 1933, with a crop growing patchily on a light, non-retentive soil, it was found that plants growing normally contained about 76 per cent. of moisture, whereas the stunted, drought-affected plants contained as little as 53 per cent. With very young lucerne in the pre-budding stage, the moisture content is distinctly higher than in the older crop, values as high as 86 per cent. having been noted.

COMPOSITION AND FEEDING VALUE OF LUCERNE

Protein and Fibre Content of Lucerne.—With increasing maturity, lucerne suffers a progressive diminution in respect of its content of crude protein. Contemporaneously with this change, the fibre content of the crop undergoes a corresponding increase. The data in Table I show that, in the earliest investigated stage of growth, the dry matter of the lucerne contained nearly 35 per cent. of crude protein and only 13.7 per cent. of fibre. During the main part of the pre-budding period of growth, the changes in the protein and fibre content were quite gradual, the sample cut on May 19 containing, on the dry matter basis, 30.5 per cent. of crude protein and 17.8 per cent. of fibre. Towards the end of the pre-budding period, however, a sharp change in the composition of the crop appeared to have taken place, the sample on May 28 containing only 23.1 per cent. of crude protein, whilst the percentage of fibre had risen abruptly to 24.3 per cent. This change in composition was due to corresponding changes in the appearance of the lucerne plants, which round about this date underwent a distinct increase in stemminess. The values for protein and fibre suffered no serious change throughout the budding period, but with the advent of the flowering period, a further pronounced alteration of composition occurred, the percentage of crude protein falling, in early flowering, to 16.2 per cent. and the fibre rising to 29.2 per cent. of the dry matter.

It is naturally of interest to compare the foregoing results with those that have been obtained for pasture herbage in the series of investigations that have been carried out at Cambridge. The general observations in respect of decreasing protein and increasing fibre content as the crop progresses in maturity are characteristic of pasture grass as well as of lucerne. Values of the order of 30 per cent. of crude protein (dry matter basis) have been noted in the case of young, leafy pasturage. In this connexion, however, it is important to realize that the high values for the protein content of pre-budding lucerne are mainly of scientific interest. Their importance in practice may be discounted, since lucerne is not usually cut at this early stage, either for feeding purposes or for artificial drying. (This matter will be discussed further in a later section of this paper.) On the other hand, although from the standpoint of yield it is not in every case desirable, pasture herbage has the advantage of being able to withstand the

COMPOSITION AND FEEDING VALUE OF LUCERNE

effects of either cutting or grazing in a very early stage of growth.

It is customary to cite the richness of lucerne in protein as one of its outstanding characteristics. Yet reference to Table I shows that in the flowering stage, when the crop is usually cut, the lucerne contained, on the basis of dry matter, only about 17.4 per cent. of crude protein. In this respect, the crop compares unfavourably with pasture herbage cut regularly at weekly, fortnightly or 3-weekly intervals.* Even under a system of regular cutting at monthly intervals, the protein-content of pasture herbage during the flush period (17.2 per cent. of the dry matter) is almost the same as that for lucerne in flower, but the higher values for the pasturage during the rest of the season bring the season's average above the value for flowering lucerne. This holds true also for pasture grass cut at 5-weekly intervals, notwithstanding that in this case the flush value (14.1 per cent. of the dry matter) is distinctly lower than the percentage of crude protein in flowering lucerne. During the period of budding, the protein-content of the lucerne (20.4 per cent. of the dry matter) lay between the average values for 3-weekly and monthly pasture cuts, and was definitely smaller than those for the weekly and fortnightly pasture cuts.

The fibre content of flowering lucerne is much higher than that of the various kinds of pasture cuts, whether the interval between successive cuts be 1, 2, 3, 4 or 5 weeks. Indeed, lucerne in flower is as fibrous as grass that has reached the usual hay stage of maturity, the lucerne value, on the basis of dry matter, being 29.7 per cent. and that for grass at the hay stage, 30.3 per cent. Even in the bud stage, lucerne is very distinctly richer in fibre than pasture herbage cut at intervals of 1, 2 or 3 weeks, and although during the flush period, pasturage cut at monthly or 5-weekly intervals may contain slightly more fibre than budding lucerne, yet the mean values for the grass over the entire season are definitely lower than for lucerne in bud. It will be shown later that the comparison on the basis of fibre is still more disadvantageous to lucerne than is suggested by the foregoing findings, for whereas the fibre in the various pasture cuts is highly digestible, that of

* It is not feasible, from considerations of space, to quote all the data for the composition of the different types of pasture cuts. The reader who wishes to consult these should refer to the recently published scientific paper, in which these details are recorded in full (see reference (2)).

COMPOSITION AND FEEDING VALUE OF LUCERNE

lucerne in both bud and flower is but poorly digested by ruminant animals.

Oil and Carbohydrate Content of Lucerne.—At no stage of growth did the lucerne samples contain significantly more crude oil than is found in grass at the hay stage of maturity, whilst if the comparison is made with the different types of pasture cuts, in which the percentage of oil varies from 4.0 to 6.5 per cent. of the dry matter, as against 2.1 to 3.3 per cent. in the lucerne samples, it will be seen that lucerne shows up in this respect to still greater disadvantage.

The amount of carbohydrate in the lucerne samples varied from about 36 to 42 per cent. of the dry matter. It may be noted that the pasture samples obtained by regular cutting from weekly to 5-weekly intervals are all somewhat richer than the lucerne samples in respect of this constituent, the average content varying from about 44 to 47 per cent. of the dry matter.

Mineral Content of Lucerne.—Lucerne is strikingly rich in mineral matter, the percentage of silica-free ash, on the basis of dry matter, varying from 8.9 per cent. (sample 5) to 11.2 per cent. (sample 9). In this respect it is obviously richer than pasture herbage, the corresponding average data for the different pasture cuts showing a range of variation from 6.8 per cent. in the 5-weekly cuts to 7.8 per cent. in the weekly and fortnightly cuts.

The data in Table I show that lucerne is outstandingly rich in lime, the amount of this constituent increasing as the plant progressed in maturity until, during the period of bloom, it had risen to 4.9 per cent. of the dry matter. Since lucerne is most frequently utilized for feeding purposes at this stage, it is interesting to note that a full dairy ration of the present lucerne in flower (30 lb. of dry matter) would have supplied $1\frac{1}{2}$ lb. of lime—i.e., an amount sufficient for maintenance and the production of 45 gallons of milk. At the same time, the amount of phosphoric acid supplied would have sufficed for maintenance and the production of $3\frac{1}{2}$ gallons of milk only. It is clear that when lucerne (or lucerne hay) is fed in conjunction with concentrates, the excess of lime that it contains must function usefully in balancing the phosphoric acid of the concentrates, the latter tending as a rule to be rich in phosphoric acid and deficient in lime.

Although pasture herbage is much less rich in lime than

COMPOSITION AND FEEDING VALUE OF LUCERNE

lucerne, it does not really compare unfavourably when both lime and phosphoric acid are taken into consideration. The lime-phosphoric acid ratio in grass comes much closer to the optimum ratio (about 1.2:1) than is the case with lucerne, a satisfactory feature in view of the fact that pasturage frequently forms the sole diet of farm animals over long periods. Further, pasture herbage contains sufficient lime and phosphoric acid to meet the ordinary requirements of grazing animals. With pasturage cut or closely-grazed at 5-weekly intervals, for example, a full ration of such herbage (30 lb. of dry matter) would furnish enough lime and phosphoric acid for maintenance of a dairy cow and the production of at least 5 gallons of milk.

In respect of the very high lime content of the Howe Hill lucerne, it should be stated that samples of lucerne from other localities in Cambridgeshire gave much lower figures, the Willingham flowering sample containing 3.2 per cent. of lime, on the basis of dry matter, and that from Gravel Hill only 2.5 per cent. Indeed, evidence was obtained in these different investigations suggesting that differences in soil conditions and manurial treatment of the crop may lead to very significant modifications of the mineral composition as a whole.

The potash content was highest in the first sample of young lucerne and fell off consistently to about 0.9 per cent. of the dry matter in the stage of bloom, a value very much lower than that for monthly pasture cuts. Like pasture herbage, the lucerne cuts were poor in soda. The chlorine content at all stages of growth was lower than that for pasture herbage under a system of monthly cutting. The percentage of organic sulphur in the lucerne samples was very similar to the value for pasturage, but the latter contained about twice as much inorganic sulphur. Estimations of cystine, the supply of which in the sheep's diet is of importance in relation to the growth of wool, indicated that the lucerne contained about 0.12 per cent. of this amino acid (dry matter basis), a value of the same order as had been obtained for pasture herbage.

Vitamin Content of Lucerne.—Like pasture grass, lucerne is a satisfactory source of vitamins A, B, C and D. Recent investigations have further shown that green lucerne is also strikingly rich in the reproductive vitamin E. Although experimental confirmation is lacking, it is extremely

COMPOSITION AND FEEDING VALUE OF LUCERNE

probable that this statement also holds true of pasture herbage.

Composition of Later Seasonal Cuts of Lucerne.—In most respects there is a good degree of similarity between the composition of the first cut of lucerne and the second and third cuts. One important distinction, however, was noted consistently, namely, that the third cut was somewhat richer in protein than the first and second cuts. Thus, whereas the first cut in flower from the Howe Hill crop contained 17.4 per cent. of crude protein (dry matter basis), the corresponding third cut contained as much as 23.3 per cent. This increased protein content is probably to be attributed to the extra leafiness of the late seasonal growth.

Digestibility and Feeding Value of Lucerne.—The results that were obtained in sheep digestion trials of lucerne in both bud and flower are recorded in Table II. The reader need only be reminded that the digestion coefficient of a food constituent is the number of parts of that constituent that are digested and assimilated per 100 parts consumed, and that starch equivalents are an expression of the nutritive value of feeding stuffs, giving the productive value of 100 lb. of the different foods in terms of a common food nutrient, namely, starch.

TABLE II.—DIGESTIBILITY AND NUTRITIVE VALUE OF FIRST-GROWTH LUCERNE (4-YEAR-OLD CROP, HOWE HILL, 1932).

Digestion period	..	..	..	..	I	2
Date of cutting	..	..	..	..	June 7-17	July 2-11
Stage of growth	..	..	..	..	Bud	Flower
					%	%
Digestion coefficient of	crude protein				75.8	74.5
"	"	crude oil			25.3	9.8
"	"	carbohydrate			74.2	70.2
"	"	crude fibre			46.3	42.6
"	"	total organic matter			65.7	60.4
<i>On basis of dry matter:</i>						
Digestible	crude protein				15.49	12.96
"	oil				0.66	0.20
"	carbohydrate				31.33	27.62
"	fibre				11.08	12.66
Total digestible	organic matter				58.56	53.44
Starch equivalent					50.81	42.44
Nutritive ratio					2.84	3.14

As might be anticipated, the digestibility of the lucerne was somewhat higher at the bud stage than at flowering. This is reflected in the digestion coefficients of the total organic matter, which fell from 65.7 to 60.4 per cent. as the crop passed from bud to flower. The values for fibre and

COMPOSITION AND FEEDING VALUE OF LUCERNE

carbohydrate underwent a similar diminution, but the reduction in digestibility of the protein constituent was so slight as to be without significance. The data further demonstrate the reduction in feeding value that occurs when the crop enters the flowering stage. The dry matter of the budding crop contained 58.6 per cent. of digestible organic matter and 50.8 per cent. of starch equivalent. During the bloom period, these values had sunk to 53.4 and 42.4 per cent. respectively. Despite the insignificant fall in protein digestibility, the flowering crop was distinctly poorer in digestible protein than the lucerne in bud, this being due to a reduction in the crude protein content from 20.4 to 17.4 per cent. of the dry matter.

A comparison of the data in Table II with corresponding data that have been obtained for pasture grass ⁽²⁾ reveals the striking fact that lucerne, both in bud and in flower, is very distinctly inferior, in respect of digestibility and nutritive value, to pasture herbage submitted to systems of cutting (or close grazing) at intervals varying from 1 to 5 weeks. The lowest digestion coefficient obtained in the whole series of pasture trials for the organic matter of the herbage was 74 per cent., while the values at the periods of highest feeding value rose beyond 83 per cent. It will be noted from Table II that the corresponding values for lucerne in bud (65.7 per cent.) and in flower (60.4 per cent.) were very much lower than even the minimum value for the pasture herbage. Similar differences in favour of the pasturage are to be noted in respect of the digestion coefficients of the crude oil, carbohydrate and fibre, particularly the last-named constituent.

The digestibility of the fibre in all the different types of pasture cuts was very high, the digestion coefficients ranging from 75.1 to 85.7 per cent. The conclusion has been drawn that the fibre in such herbage is composed substantially of the digestible form of cellulose in association with but small amounts of the indigestible lignocellulose. The condition of the fibre in lucerne at the stages of bud and flower, however, is markedly different. Even in the budding stage, the fibre digestion coefficient was as low as 46.3 per cent., whilst in the bloom stage, the value (42.6 per cent.) was only about half the figure obtained for the pasture cuts at their phases of highest fibre digestibility. It must be concluded that the fibre in lucerne, unlike that in pasture herbage, is highly lignified, a conclusion in keeping with

COMPOSITION AND FEEDING VALUE OF LUCERNE

the observed hard and woody nature of the stems of the lucerne plants during the stages of both bud and flower. In view of the fact that nearly 30 per cent. of the food material in the ration of flowering lucerne consisted of this indigestible type of fibre, it is not difficult to understand why the digestibility of the lucerne as a whole was so distinctly inferior to that of the pasture cuts. The presence of large amounts of woody fibre in the faeces of the sheep, during the digestion trials of the lucerne at both stages of growth, was very apparent to the eye.

It is clear from the results of the present trials that the lucerne cuts cannot be included in the same category as the pasture cuts. Having regard to their low starch equivalent and high content of indigestible fibre, they must be regarded as having closer kinship with the coarse fodders than with the concentrated foods. The correctness of this inference is emphasized by the figures in Table III, in which the essential data for the lucerne cuts are compared with the corresponding data for meadow hay and for pasture herbage cut at fortnightly or monthly intervals.

TABLE III.—COMPARISON OF NUTRITIVE VALUES OF LUCERNE, PASTURE HERBAGE AND MEADOW HAY (DRY MATTER BASIS).

	Meadow hay		Lucerne				Pasture herbage (mean values for season)	
	Very good quality	Medium quality	In bud	In flower	Fort-nightly cuts	Monthly cuts		
	%	%	%	%	%	%		
Crude fibre	25.8	34.1	23.9	29.7	15.9			
Digestion coefficients of organic matter	64.6	51.9	65.7	60.4	78.0-82.3			76.7-83.4
Digestion coefficients of crude fibre	63.0	52.4	46.3	42.6	80.3-82.3			78.6-84.9
Digestible protein	8.7	5.4	15.5	13.0	18.8			14.7
„ organic matter	59.3	48.7	58.6	53.4	72.2			72.5
Starch equivalent	45.2	29.2	50.8	42.4	69.9			67.1

Table III indicates that, on the dry matter basis, the lucerne cut during the stage of early to advanced bud formation was, in respect of starch equivalent, somewhat superior to a very good grade of meadow hay, whereas during the period of flowering, it was slightly inferior. Since, in practice, it would usually be cut when coming into bloom, the inference may be drawn that the starch equivalent would be comparable, on the dry matter basis, with that of very good meadow hay. The digestibility of the fibre in the lucerne, however, would be distinctly lower than that of the

COMPOSITION AND FEEDING VALUE OF LUCERNE

hay fibre, but, on the other hand, the lucerne would be much richer in digestible protein. It may be noted that the comparison would be less favourable to lucerne if it were made on the basis of lucerne hay instead of green lucerne, since the conversion of the green crop into hay would almost certainly be accompanied by a reduction in digestibility and nutritive value as a consequence of the breaking off and loss of valuable leaf. This aspect of the problem is being studied at the present time.

Considered from the standpoint of the coarse fodders, therefore, lucerne constitutes a very valuable food. Taking the pasture cuts as the standard of comparison, however, the lucerne both in bud and flower was markedly inferior, as is clear from the data in Table III. On the basis of the results of the present investigation, it must be concluded that the product obtained by the artificial drying of lucerne (lucerne meal) is likely to have a very distinctly lower nutritive value than that of grass cut regularly at intervals varying from 1 to 5 weeks and dried down similarly. Such dried grass has the nutritive value associated with a concentrated food, whereas lucerne would appear to yield a dried product having the nutritive character of a superior coarse fodder. The special object of lucerne drying is primarily to enable the crop to be conserved without losses of nutrients, due to respiration changes and the breaking off of leafage, which accompany its conservation in the form of hay. To obtain a product comparable with artificially dried young grass, it would seem to be necessary to reject the woody stems and dry down the lucerne foliage separately (lucerne leaf meal).

TABLE IV.—YIELD OF LUCERNE FROM WILLINGHAM CROP (1932) COMPARED WITH YIELDS OF PASTURE HERBAGE FROM HEAVY-LAND PASTURAGE UNDER SYSTEM OF INTENSIVE FERTILIZING AND MONTHLY CUTTING.

	lb. dry matter per acre	lb. starch equivalent (a) per acre	lb. digestible protein (a) per acre
Pasture herbage (1930) (b)	7996	5357	1127
„ (1931) (c)	8274	5544	1167
„ (1932) (c)	6714	4498	947
Willingham lucerne (1932)	7191	3425	1164

(a) Assuming, for lucerne, the starch equivalents and protein digestion coefficients obtained for the different cuts from the Howe Hill lucerne crop; for monthly-mown pasture herbage, on the dry matter basis, 67 per cent. of starch equivalent and 14.1 per cent. of digestible protein.

(b) See reference (3).

(c) Unpublished data.

COMPOSITION AND FEEDING VALUE OF LUCERNE

The data in Table IV bring out the interesting finding that under good conditions (i.e., in respect of type of herbage and of manurial and climatic factors) the yield from permanent pasture, in terms of dry matter, may be of the same order as that from the lucerne crop. Thus, during the two good grass seasons 1930 and 1931, the heavy-land pasture under consideration gave a definitely higher yield of dry matter per acre than was obtained from the excellent crop of lucerne at Willingham in 1932. The conditions for growth of pasture during 1932, owing to a cold, late spring, were not so favourable as in the previous two years; yet the yield from the pasture (6,714 lb. of dry matter per acre) was not very much lower than the yield from the lucerne (7,191 lb. dry matter per acre). Owing to the higher digestibility of the pasture herbage, the yield of starch equivalent per acre of pasturage was in all these seasons substantially higher than for the 1932 lucerne crop. Even in respect of production of digestible protein, from which standpoint lucerne has a special reputation, the pasture compared very satisfactorily with the lucerne.

In considering the significance of these findings in relation to the problem of crop-drying, it must be borne in mind that the yield from pastures may be much lowered when the factors influencing productivity are unfavourable. Thus, in the exceptionally droughty season of 1929, the heavy-land pasture yielded only 3,982 lb. of dry matter per acre. Again, during the favourable 1930 season, the yield from a poorer light-land type of pasture was only 5,365 lb., compared with 7,996 lb. of dry matter per acre from the heavy-land pasture. Presumably, however, grass-drying on an industrial scale would only be attempted on highly-productive types of grass land situated in those parts of the country where rainfall is usually favourable to sustained growth throughout the season, just as in the same way the drying of lucerne must necessarily be restricted to areas that are suitable to its cultivation. In this connexion it is important to note that, judged on the basis of the 1932 Willingham data, lucerne appears to display a diminishing intensity of productivity as the season advances. As with pasturage, though perhaps not to such a degree, the productivity of lucerne is highest during the early part of the season and falls off considerably in the later periods. It will be advisable, however, to postpone the final discussion of the relative merits of grass and lucerne from the standpoint of yield of

COMPOSITION AND FEEDING VALUE OF LUCERNE

dry matter, starch equivalent and digestible protein until further data have been accumulated from future investigations.

Further Problems for Investigation.—Much work requires still to be done before the nutritional characteristics of the lucerne crop can be elucidated fully. Among the problems calling for further investigation may be cited the following:—

(1) *The Feeding Value of Lucerne Meal and Lucerne Leaf Meal.*—The composition and nutritive value of lucerne meal must depend substantially on the stage of growth at which the crop is cut for drying and grinding. It appears, from information secured by the writer during the past season, that efforts are being made to ensure that lucerne is being cut in this country at the bud stage for this purpose. It is possible that the process of grinding the dried product to a fine meal may lead to a distinct improvement in digestibility and feeding value, and that the nutritive value of the meal may be significantly higher than might be anticipated from a consideration of the digestibility and starch equivalent of the green lucerne.

Lucerne leaf meal, made solely from the foliage of the crop, from which has been excluded the stems of the plant with their high content of woody fibre, should be a most valuable feeding product, capable of being used as protein concentrate in the feeding of all kinds of livestock. So far the writer has been unable to procure supplies of this product in this country, but is hopeful of obtaining a sufficient quantity from the United States for purposes of investigation. The woody stems that are rejected in the process of manufacture could scarcely be used for feeding purposes, but it should not be difficult to discover a useful industrial application for such tough, fibrous material.

(2) *The Leaf Stem Ratio.*—Possibly more so than with grass, the leaf stem ratio is the factor that determines the nutritive value of lucerne. Other factors being equal, the variety of lucerne to be preferred is that which yields the highest weight of leaf in relation to stem. Information on this question would further be useful in coming to a conclusion respecting the economy, or otherwise, of the process of manufacture of lucerne leaf meal.

(3) *What is the Earliest Stage at which Lucerne can be cut without injuring the Plant?*—It has been shown that, as

COMPOSITION AND FEEDING VALUE OF LUCERNE

with pasture grass, lucerne has its highest protein content and feeding value in its earliest stages of growth. The results of investigations carried out during the year 1933, and not yet published, have shown that pre-budding lucerne has a digestibility and nutritive value approximating to those of young grass. It is probable, however, that this finding is not vested with much practical significance, since it is generally recognised that early cutting is distinctly harmful to the lucerne crop. Indeed, constant cutting even at the budding stage is stated to weaken the plant and shorten the economic life of the stand. The appropriate time for cutting is said to be indicated by the development of new shoots from the crown, and this usually occurs when the crop is about half in bloom.⁽⁴⁾ In the experience of the writer, farmers usually take the first cut when the crop is well advanced in bud, or in very early flower, while the second and third cuts are made when the crop is well in bloom.

It is not possible to pronounce finally on this question at the present time, but from the work already done it is clear that although a greater number of cuts may be obtained in a season by cutting at the pre-budding stage, yet the yield of dry matter per acre is very much smaller than is obtained by taking a smaller number of cuts at either the budding or flowering stage. Further, by cutting frequently at the pre-budding stage, it has been found to be a much more difficult matter to keep down weed infestation than when the crop is allowed to grow on to bud or flower, and exert its smothering effect in the highest degree.

Investigations into these and kindred problems are being made at the present time, and it is hoped, at some future date, to report on the results to readers of this JOURNAL.

REFERENCES.

- (1) Thornton: *Jour. Min. Agric.* (1932), XXXIX, 420.
- (2) Woodman, Evans and Norman: *Jour. Agric. Sci.* (1933), XXIII, 419.
- (3) Woodman and Underwood: *Jour. Agric. Sci.* (1932), XXII, 26.
- (4) Thornton and Nicol: *Jour. Min. Agric.* (1932), XXXIX, 46.

THE LOGANBERRY CANE MAGGOT

L. N. STANILAND, A.R.C.S., D.I.C.,

Advisory Entomologist, Seale-Hayne Agricultural College.

DURING the early part of June, 1933, a peculiar wilting of the tips of young canes of loganberry was observed in a plantation in South Devon. The wilted tips of the young canes were, in most cases, of a typical purple colour, and, in many instances, a new shoot had been pushed out just behind the wilted portion. All stages of the wilting could be found, from the first signs of flagging, when the cane was still green, up to a wilted tip that had turned purple and had in some instances fallen off. The appearance of the wilted shoots is shown in Fig. 1.

On cutting open the affected shoots, it was found that the damage was caused by the maggots of a fly that had tunnelled down the centres of the shoots; the maggots were seen to be working their way down the canes. After boring downwards for some inches, the maggots were girdling the shoot and also making a small hole through to the outside of it, thus bringing about the wilting referred to. A section through an affected shoot is shown in Fig. 2. The maggots then proceeded down the canes, which had in some instances to be cut back as much as two feet in order to find the maggots.

The area of loganberries, at the farm in question, was about one acre, and about 2 per cent. of the new canes were affected. Damage was not observed on any but young canes. Whilst the loss to the grower was not great, the damage to the affected canes was often severe, since the length of available fruiting cane for the following year was greatly reduced. The grower stated that a slight amount of similar damage had been observed during 1932.

A perusal of the available literature strongly suggested that the insect might be the Raspberry Cane Maggot (*Phorbia rubivora*, Coq.), which is a serious pest in the United States and in Canada (3, 4, 5).*

It was also found that Theobald (1, 2), in 1912 and 1913, had recorded similar attacks on both raspberries and loganberries in England. In 1912, an attack was noted

* For references, see page 153.

THE LOGANBERRY CANE MAGGOT

on June 1 (Berkshire); and another on brambles (Kent). The maggot found was stated to resemble a species of *Phorbia*. Theobald suggested that the presence of the insect on brambles might be taken as showing that the pest could probably be regarded as a species native to this country. During 1913, Theobald recorded several more cases on raspberry and loganberry, Worcester being mentioned as one of the centres. The maggots changed to brown puparia and Theobald was able to hatch out one fly. This was sent to Mr. F. E. Edwards, of the British Museum, who reported: "It seems to be allied to *Phorbia pudica*, Rondani." The writer also understands that, in 1920 and 1921, specimens of similarly damaged raspberry and loganberry shoots were received at the Royal Horticultural Society's gardens at Wisley.

The life history of the Raspberry Cane Maggot in the United States and Canada is briefly as follows: The adult flies make their appearance about the end of April, and lay small white eggs on the tops of the young canes of raspberries, loganberries and blackberries. The maggots burrow into the canes, tunnel downwards for a short distance, and then girdle the shoot, thus causing the wilting. The maggots then proceed right down through the shoot to the base, near the ground. In this situation, pupation takes place towards the end of June or in early July. The maggots are about $\frac{1}{2}$ in. in length when fully grown, creamy white in colour, with a tendency towards orange coloration at the hinder end of the body. The pupæ remain in the shoot till the following spring, when emergence of the flies takes place. There is only one generation of the insect in each year.

The question arises whether the insect found in South Devon is the American Raspberry Cane Maggot that has, in some way, been introduced into this country, or whether it is a native species that for some reason increased during 1912 and 1913, and again in 1932 and 1933. Attempts are being made to breed the fly from material collected in South Devon, in order to throw further light on the question. It seemed possible that, in the present instance, the pest had been introduced when the grower acquired his loganberry plants from an outside source. The matter was followed up, with the collaboration of the Ministry's Inspectors, but no evidence of the existence of the insect elsewhere was dis-

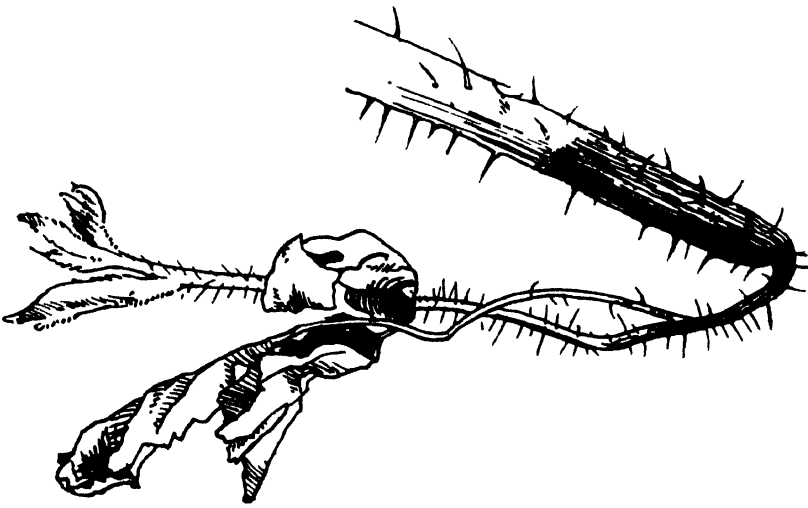


FIG. 1. Typical appearance of killed shoot attacked by the Loganberry Cane Borer

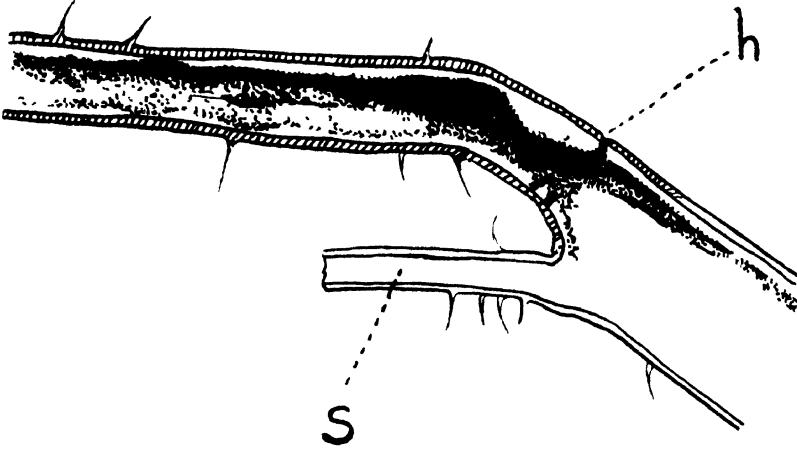


FIG. 2. Section through affected shoot to show girdling of stem and small hole (h). A new shoot (s) is shown growing below the point of attack.

THE LOGANBERRY CANE MAGGOT

covered, and the attack in South Devon remains an isolated one.

It is clear that, if it became common, the pest could be a source of much trouble. It has therefore been thought advisable to bring it to the notice of growers so that they may be forewarned should any damage, similar to that shown in Fig. 1, be observed on their plantations.

In the meantime, an endeavour has been made to exterminate the pest on the infested premises. Control should be fairly easy to effect by cutting out and burning affected shoots, and the loganberries have been gone over several times in this way very thoroughly. Great care has been exercised to cut off the affected shoots well below the point of wilting as soon as the damage was obvious; if necessary, further cane was cut off until all signs of tunnelling had disappeared.

Thanks are due to Mr. J. C. F. Fryer and Mr. C. T. Gimingham, of the Ministry's Plant Pathological Laboratory, Harpenden, Herts; also to the grower of the loganberries and to the growers elsewhere, for much ready assistance.

REFERENCES.

- (1) Theobald, F. V.: *Jour. South-Eastern Agric. College, Wye, Kent*, 1912, pp. 154-156, one figure.
- (2) Theobald, F. V.: *ibid.*, 1913, pp. 232-233, two figures.
- (3) Slingerland, M. V.: *Bull. 126, Cornell Univ. Agric. Expt. Sta., Div. Entomology*, p. 54, Feb., 1897.
- (4) Slingerland, M. V.: *The Can. Entom.*, 1897, Vol. XXIX, pp. 162-163.
- (5) Sanderson, E. D.: *Insect Pests of Farm, Garden and Orchard*. (London, Chapman & Hall, Ltd.), pp. 469-472, 5 figures.

CONTROL OF THE CABBAGE ROOT FLY

E. E. EDWARDS, M.Sc.,

Advisory Entomologist, Harper Adams Agricultural College.

ALTHOUGH the Cabbage Root Fly has been the subject of a good deal of investigation during the past three decades, the methods of control so far devised have not proved entirely satisfactory. Further trials, continued over several seasons, were required to furnish the necessary quantitative evidence upon which recommendations for adequate control could be based; and, with the object of supplying this evidence, comparative control trials, designed to continue over three years, were arranged by the writer, in 1931, at 5 centres in the West Midland Province.

Preliminary Experiments, 1931.—The three direct control methods, suggested in the Ministry's leaflet,* were included in the first year's series of trials, and a weak solution of alum was also tested. The very striking results, obtained at all centres, were published in this JOURNAL for March, 1932. Briefly, the results then given showed that Cabbage Root Fly infestations, ranging from 44 to 63 per cent.—as shown by the number of plants destroyed on the control (untreated) plots—were reduced, by applications of corrosive sublimate solution, to a percentage in no case greater than 7 per cent. Similar infestations were reduced on an average at all centres to 18 per cent. by the tarred felt disc method, and to 22 per cent. by the use of naphthalene powder. Little or no reduction was obtained by the use of alum.

Experiments in 1932 and 1933.—Of the four treatments employed in the 1931 experiments, applications of corrosive sublimate and naphthalene were considered sufficiently practical to merit further trial under commercial conditions. It was decided, therefore, to concentrate upon these two treatments in both the 1932 and 1933 investigations. Corrosive sublimate used in a modified form as a single application was also included in the trials.

* See Advisory Leaflet No. 18.

CONTROL OF THE CABBAGE ROOT FLY

In both years the control treatments given below were tested on cauliflowers:—

- (a) *Corrosive Sublimate (Mercuric chloride)*.—This substance was used at a strength of 1 oz. in 8 gal. of water. About $\frac{1}{2}$ -pint of the diluted solution was allowed for each plant and applied so as to flood the soil evenly around the base of the plant. Three applications were made at approximately 10-day intervals, starting three days after setting out the plants.
- (b) *Corrosive Sublimate (Mercuric chloride)*.—Roots of cauliflower seedlings, at the time of transplanting, were immersed for 15 minutes in corrosive sublimate solution (1 oz. in 8 gal. of water) to which had been added sufficient soil to convert it into fairly thick "cream".
- (c) *Naphthalene*.—The grade of naphthalene used was "drained creosote salts", and was obtained, as in 1931, from the Gas Light and Coke Company, London. About $\frac{1}{2}$ -oz. of this powder was applied by hand to the soil round the plants, care being taken, as far as possible, to avoid sprinkling the powder on the plants, which might be scorched thereby. Applications were made on three occasions at 10-day intervals, starting immediately after setting out the plants.

Lay-out of Trials.—The treatments were tested in both years at four centres, each experimental area being divided into five plots:—

- Plot 1. Corrosive sublimate solution.
- Plot 2. Control (untreated).
- Plot 3. Corrosive sublimate "cream".
- Plot 4. Control (untreated).
- Plot 5. Naphthalene.

At least 100 plants per plot were used at each of the four centres. At all centres, the plot treated with naphthalene was well separated from the other experimental plots. Further, plots 2, 3, 4 and 5 were given an equivalent quantity of water to that used when applying the corrosive sublimate solution to plot 1.

Plants Used.—As in the 1931 trials, cauliflowers of the variety Veitch's Autumn Giant were planted. The seeds were sown in boxes under glass in early spring and the plants set out on the plots towards the end of May or during June. The distances of planting were 2 ft. between the rows and 1 ft. 6 in. between the plants in the row. No farmyard manure was applied in the spring, but a dressing of a complete fertilizer, at the rate of 9 cwt. to the acre, was given to all plots at the time of transplanting.

Effect of Treatments upon Growth and Vigour of the Plants.—As in 1931, the treatments in 1932 and 1933 exerted a marked stimulating influence on growth and vigour of the plants. This stimulating effect gradually

* Corrosive sublimate, being highly poisonous, should be handled with great care. It should be clearly labelled and kept under lock and key in charge of a responsible person. In these trials all vessels used for it were thoroughly washed after each application

CONTROL OF THE CABBAGE ROOT FLY

became less apparent on Plots 3 and 5 until ultimately little difference was found between these treated plants and the controls. The effect of three applications of corrosive sublimate solution (Plot 1) was, on the other hand, much more persistent, the plants treated in this way clearly remaining the most flourishing of all throughout the season; in most instances they were ready for market some seven or nine days before those on the control plots.

Effect of Treatments upon the Root Fly Injury.—Weekly examinations of the plots were carried out in both years from the time of planting until about the middle of August, when final counts of attacked and unattacked plants were made. As in the 1931 trials, healthy plants, sure to reach maturity, were regarded as unattacked, whilst those attacked were pulled up for examination of the roots.

Time of transplanting, dates of treatments, and the final counts of the plants destroyed by Cabbage Root Fly at each of the four centres in 1932 and 1933 are given in Tables I and II respectively. The figures show that three applications of corrosive sublimate solution (Plot 1) controlled Cabbage Root Fly to a remarkably satisfactory degree at all centres in both years. The infestations, as judged by the number of plants destroyed on the control (untreated) plots (Nos. 2, 4), were reduced to figures in no instance greater than 9 per cent. The average percentage of unattacked plants on the plots treated with this solution, at all centres, was 93 in 1932 and 94 in 1933, as compared with 24 for the controls in both years (Tables III and IV). The increase in the marketable or unattacked plants due to the applications of corrosive sublimate solution was, therefore, at the rate of 69 and 70 per cent. in the 1932 and 1933 trials, respectively.

Much less satisfactory results were obtained in both years by dipping the roots of the plants, for 15 minutes before setting, in corrosive sublimate "cream" (Plot 3). This treatment gave, on an average for all centres, an increase of only 27 per cent. of unattacked plants in the 1932 trials and 17 per cent. in those of 1933 (Tables III, IV).

On the whole, the results from the use of naphthalene (Plot 5) were also disappointing, particularly in view of the fact that, in the 1931 trials, this treatment afforded a fairly satisfactory measure of protection against Cabbage Root Fly, and compared favourably in this respect with the corrosive sublimate solution (Plot 1). The average increase

CONTROL OF THE CABBAGE ROOT FLY

CONTROL OF CABBAGE ROOT FLY — 1932
TABLE I

Centre	Index of Plot	Date of Planting	Treatment	Dates of Application	Percentage destroyed by Root Fly
Alrewas	1	May 26	Corrosive sublimate solution	May 30, June 8, 17	8
	3	"	Corrosive sublimate "cream"	May 26	66
	5	"	Naphthalene	May 26, June 6, 16	50
	2	"	Untreated	—	96
	4	"	Untreated	—	87
Sambrook	1	June 3	Corrosive sublimate solution	June 6, 16, 26	6
	3	"	Corrosive sublimate "cream"	June 3	45
	5	"	Naphthalene	June 3, 13, 23	20
	2	"	Untreated	—	81
	4	"	Untreated	—	74
Lichfield	1	June 14	Corrosive sublimate solution	June 17, 27, July 7	9
	3	"	Corrosive sublimate "cream"	June 14	37
	5	"	Naphthalene	June 14, 24, July 4	31
	2	"	Untreated	—	64
	4	"	Untreated	—	66
Brewood	1	June 28	Corrosive sublimate solution	July 1, 11, 21	Nil
	3	"	Corrosive sublimate "cream"	June 28	8
	5	"	Naphthalene	June 28, July 8, 18	3
	2	"	Untreated	—	10
	4	"	Untreated	—	15

CONTROL OF THE CABBAGE ROOT FLY

CONTROL OF CABBAGE ROOT FLY—1933
TABLE II

Centre	Index of Plot	Date of Planting	Treatment	Dates of Application	Percentage destroyed by Root Fly
Alrewas	1	May 24	Corrosive sublimate solution	May 27, June 3, 12	5
	3	"	Corrosive sublimate "cream"	May 24,	100
	5	"	Naphthalene	May 24, June 3, 12	100
	2	"	Untreated	—	100
	4	"	Untreated	—	100
Sambrook	1	June 6	Corrosive sublimate solution	June 9, 19, 29	8
	3	"	Corrosive sublimate "cream"	June 6	58
	5	"	Naphthalene	June 6, 16, 26	60
	2	"	Untreated	—	82
	4	"	Untreated	—	89
Audley Raven's Lane	1	June 16	Corrosive sublimate solution	June 19, 29, July 10	5
	3	"	Corrosive sublimate "cream"	June 16	20
	5	"	Naphthalene	June 16, 26, July 6	24
	2	"	Untreated	—	40
	4	"	Untreated	—	46
Lichfield	1	June 29	Corrosive sublimate solution	July 3, 13, 23	Nil
	3	"	Corrosive sublimate "cream"	June 29	"
	5	"	Naphthalene	June 29, July 8, 18	"
	2	"	Untreated	—	"
	4	"	Untreated	—	"

CONTROL OF THE CABBAGE ROOT FLY

for all centres in the number of unattacked plants, due to the naphthalene treatment, was at the rate of 43 per cent. in 1932 and 15 per cent. in 1933 (Tables III, IV).

CONTROL OF CABBAGE ROOT FLY — 1932
TABLE III. (AVERAGE ALL CENTRES)*

Index of Plot	Treatment	Percentage of plants		Increased percentage of unattacked plants over control
		Attacked	Unattacked	
2 & 4	Control	76	24	—
1	Corrosive sublimate "cream"	7	93	69
3	Corrosive sublimate solution	49	51	27
5	Naphthalene	33	67	43

* Brewood not included since infestation at this centre was almost negligible.

CONTROL OF CABBAGE ROOT FLY—1933
TABLE IV. (AVERAGE ALL CENTRES)*

Index of Plot	Treatment	Percentage of plants		Increased percentage of unattacked plants over control
		Attacked	Unattacked	
2 & 4	Control	76	24	—
1	Corrosive sublimate solution	6	94	70
3	Corrosive sublimate "cream"	59	41	17
5	Naphthalene	61	39	15

* Lichfield not included since infestation at this centre was negligible.

Effect of Weather Conditions upon the Results Obtained.—On comparing Tables I and II, it will be seen that corrosive sublimate solution (Plot 1) gave consistently satisfactory control of the Cabbage Root Fly in both seasons and at all centres, and, in this respect, the results with this treatment are in entire agreement with those obtained in the 1931 trials.

Naphthalene was more effective in 1932 than in 1933, and a probable explanation of the divergent figures may be found in the weather conditions prevailing at the time of planting or, more especially, over a short period there-

CONTROL OF THE CABBAGE ROOT FLY

after. The season of 1933 was abnormally dry throughout this critical period, whilst the corresponding time of 1932 was comparatively wet. The degree of control given by using naphthalene also varied to a considerable extent at different centres. In 1933 at Sambrook (Table II) an infestation of 85 per cent.—as shown by the average number of plants destroyed on the untreated plots—was reduced by 25 per cent. In the same year, at Alrewas, where the infestation was 100 per cent., the treatment failed completely to effect any reduction in the amount of damage caused by the Root Fly. In the 1932 trials (Table I), infestations of 91 per cent. at Alrewas, 77 at Sambrook, 65 at Lichfield and 12 at Brewood, were reduced by 41, 57, 34 and 9 per cent. respectively.

Effect of Time of Planting upon Root Fly Injury.—

One important practical point was demonstrated in this series of experiments, namely, that the date of setting the plants is of great importance in relation to the degree of infestation by the Cabbage Root Fly. In the 1933 trials at Lichfield (Table II), the cauliflowers were transplanted on June 29, and no injury by the Root Fly was apparent, although 85 per cent. of non-experimental brassicæ, planted in the last week of May, were destroyed. In the 1933 trials at Alrewas, the planting-out was done as early as May 24, and 100 per cent. of the cauliflowers on the untreated plots were killed. At the other two centres, planting was carried out on June 6 and 16, and the degrees of infestation on the control plots were on an average 85 and 43 per cent. respectively. Similar correlation between the time of transplanting and the amount of damage by the Root Fly was also well demonstrated in the 1932 trials (Table I).

It would appear from these figures that, if planting-out is deferred until about the last week in June, the loss from Cabbage Root Fly injury, at least in the West Midland Counties, could be reduced to a minimum. It is realized, however, that late planting cannot generally be adopted under commercial conditions, but planting should take place at the latest possible date having due regard to climatic, soil and market conditions.

General Conclusions.—From the experiments here described, and from those reported in a previous article,* it would appear that the use of corrosive sublimate, applied

* This JOURNAL, March, 1933.

CONTROL OF THE CABBAGE ROOT FLY

at a strength of 1 oz. in 8 gal. of water, is the most successful means, at present known, of reducing the damage done to plants of the cabbage tribe (*Brassicæ*) by the Cabbage Root Fly. The treatment consists in applying to each plant about $\frac{1}{4}$ -pint of the solution in such a manner as to flood the soil evenly round the base of the plants on three occasions at 10-day intervals, starting four days after setting out the plants.

Of the other methods tested, commercial naphthalene powder seems to offer the simplest solution of the problem of Cabbage Root Fly control. About $\frac{1}{4}$ -oz. of this powder should be applied to the soil round the plants on three occasions at 10-day intervals, commencing on the day of transplanting. This treatment possesses certain advantages, especially as regards cheapness, simplicity of application and the non-poisonous nature of the substance, and it has sometimes given excellent results. One hesitates to recommend it, however, since the experimental data show that it cannot always be relied upon to give efficient control under widely different climatic and soil conditions.

In conclusion, acknowledgments must be made to the Staffordshire Education Authority and their staffs at Alrewas, Brewood, Audley Raven's Lane Senior and Lichfield Central Schools, for valuable assistance given in connexion with these experiments.

BIRDSFOOT TREFOIL

D. H. ROBINSON, B.Sc., Ph.D.,

Harper Adams Agricultural College, Newport, Salop.

USED in its widest sense, the term Birdsfoot Trefoil includes the following species:—Common Birdsfoot Trefoil (*Lotus corniculatus*, L.) and its numerous varieties; Greater, or Marsh Birdsfoot Trefoil (*Lotus major*, Scop. sec. Smith L. = *uliginosus*, Schk.); Slender Birdsfoot Trefoil (*Lotus angustissimus*, L.); and Hispid Birdsfoot Trefoil (*Lotus hispidus*, Desf.).

Lotus angustissimus and *Lotus hispidus* are annuals. They are not employed as agricultural crops in this country, nor is there much probability of their being so used in the future. They enjoy, however, a considerable local popularity in New Zealand, where conditions of farming are rather different.

The Common and Greater Birdsfoot Trefoils are perennials. They are very similar in appearance, but differ considerably in their normal distribution. The former is typically a plant of light dry soil, whilst the latter prefers moist, shady places. Their respective uses in agriculture are consequently not entirely similar.

Description of the Plants.—The common Birdsfoot Trefoil has a characteristic long, well-developed tap-root with numerous lateral branches, which enable it to withstand any drought likely to be experienced in this country. The stems are numerous, either spreading on the ground, decumbent, ascending or erect. They vary in length from a few inches to two or more feet. They are solid at the base, more or less hollow and filled with a pith in the upper parts. Native plants are free from hairs, or almost so. The basal part of the stem may be covered with soil for a few inches, and it then becomes whitish in colour; but it remains slender and does not produce roots at its nodes—important distinctions from the Greater Birdsfoot Trefoil. The leaves are very characteristic. They are alternate: each leaf consists of five leaflets, a terminal one and two lateral leaflets at the apex of the common footstalk, and a pair of opposite leaflets at the base, resembling stipules. The leaflets have very short stalks and indistinct veins, and are usually ovate, or

BIRDSFOOT TREFOIL

obovate, and pointed. The flower-head is borne at the top of a long stalk, usually about five times as long as the leaves. Each flower is on a separate, short, curved stalk, and is more or less horizontal. There are usually not more than five flowers in each head: each flower is yellow or orange, sometimes tinged with red. The fruit is a long, narrow, cylindrical pod from 2-4 cm. long, turning brown when ripe. It splits longitudinally to release numerous small, chocolate-brown or speckled seeds.

The Greater Birdsfoot Trefoil closely resembles the above species, but may be distinguished by the following differences. Distinct underground "runners" or rhizomes spring from the crown of the plant. They are often several inches long, about as thick as a crow's quill, and *root* at the nodes. The leaves are larger, and the veins, especially on the underside, are conspicuous. Usually the stems are longer and somewhat trailing. The flower-head usually contains more than five flowers, sometimes as many as fifteen. The flowers are smaller and the fruit is narrower; the seed is much smaller, and of a yellow or olive-green colour.

Seed: its Sources and Impurities.—Seed of *Lotus corniculatus* is either almost spherical or shaped like a short, stumpy seed of red clover. Its colour is a shining olive-brown, frequently flecked with darker spots. It has a length of 1.4-1.8 mm., a breadth of 0.8-1.5 mm., and a thickness of approximately 1.0 mm. The average weight of 1,000 seeds is 1.15 grammes. The bushel weighs from 62-66 lb.

Most of the seed is of European origin, and is produced in Italy, Hungary, France and Germany. Denmark used to grow seed, but its cultivation is declining on account of inferior quality. A certain amount is grown in Sweden. A very small quantity is annually separated out from Wild White Clover seed harvested from Kentish pastures, but it is probable that the quantity so produced, dressed to a purity of 80 per cent., does not amount to more than half a ton at most—in a bad season the amount obtained would be very much less. The germination of this indigenous seed may be very poor.

The chief impurities in the seed, in addition to seeds of other leguminous plants like red clover and yellow trefoil, are the narrow-leaved Plantain or Ribwort (*Plantago lanceolata*) and Dodder (*Cuscuta trifolii* Bab.). Bussard

BIRDSFOOT TREFOIL

(1923) reported a case in which there were 6,600 seeds of dodder per kilogramme of *Lotus corniculatus* seed.

Good examples of *Lotus corniculatus* seed should have a purity of not less than 90 per cent. and a germination of 85 per cent. Indigenous seed from Kent may have a purity of only 85 per cent., but the impurities are mostly seeds of the useful leguminous plants.

Seed of *Lotus major* is globular or heart-shaped. It varies in colour from olive-green to a greenish-brown: there is no speckling. It has a length of 1.0-1.4 mm., a breadth of 0.7-1.1 mm. and a thickness of 0.3-0.8 mm.; and 1,000 seeds weigh approximately 0.5 gramme. It is grown chiefly in North Hanover and West Germany. A certain amount is produced in France and Italy, whilst New Zealand now supplies part of her own requirements. An insignificant amount is separated out from Kentish wild white clover seed, but on account of the similarity in size of the two species of seeds it is difficult to obtain *Lotus major* at all pure.

The chief impurities are various species of grass seeds, *Brunella vulgaris* and *Plantago lanceolata*. New Zealand seed may be heavily contaminated with *Lotus hispidus*.

Lotus major should have a purity of between 87 and 93 per cent.

Types of *Lotus corniculatus*.—From a practical point of view, one may consider that there exist three different types of *Lotus corniculatus*. They are:—(1) The Dwarf, indigenous type; (2) the Erect Narrow-leaved type; and (3) the Erect Broad-leaved type.

(1) *The Dwarf Indigenous Type* (var. *arvensis*, Pers.) is the one found growing naturally in our permanent pastures situated on the lighter types of soil. When grazed, the stems remain short and are supported in an erect position by the other herbage. If, however, plants of this type be removed and planted out in a garden with plenty of space, the stems display a more prostrate habit of growth. Many of them form, in these circumstances, a dense circular mat of foliage lying close to the surface of the soil. In others, the greater part of the stem is prostrate, but the tips grow erect. There is a great variety in number and length of stems, number of flower-heads and so forth, but the leaflets are always broad in relation to their length.

-When kept closely grazed, the amount of keep afforded by this type of Birdsfoot Trefoil is not large. Judging

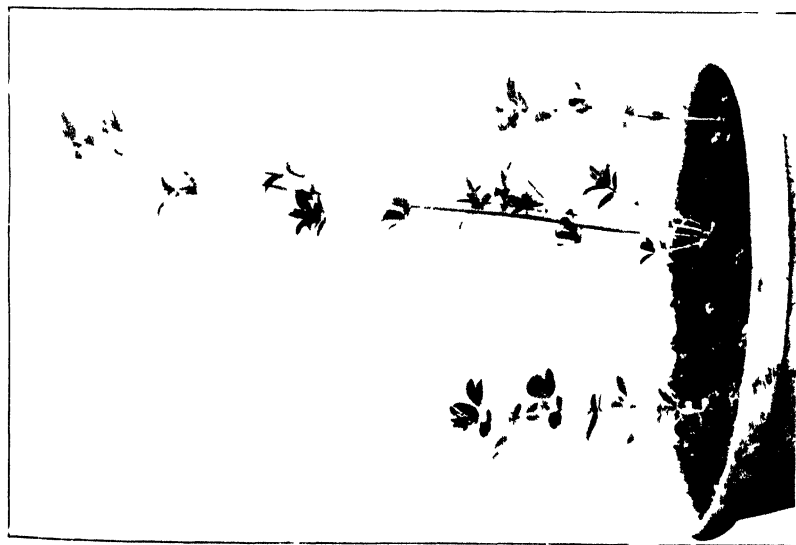


FIG. 1. (Left to right) seedlings of *L. corniculatus* (narrow leaved type) and *L. corniculatus* (dwarf type)

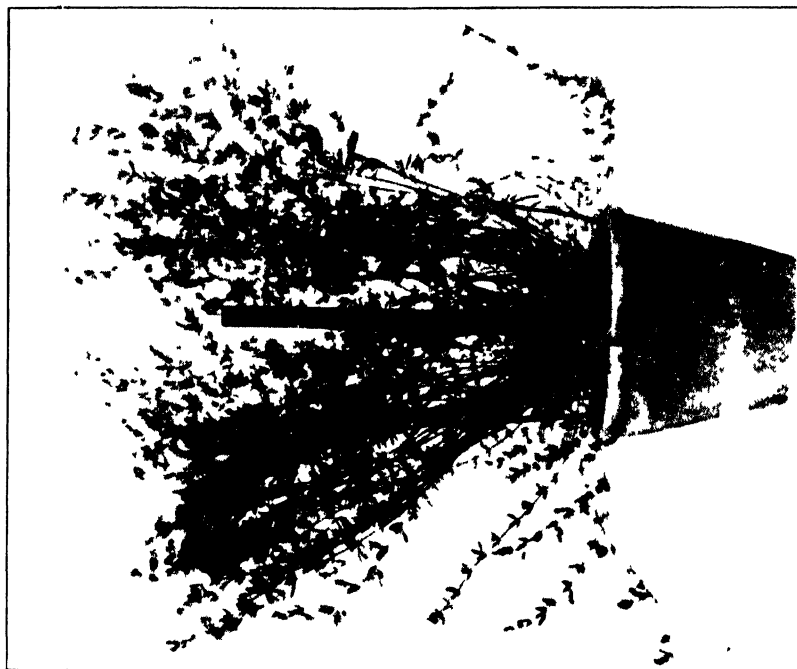


FIG. 2 One year old plant of *L. corniculatus* (narrow-leaved type)
The rule is one metre long.

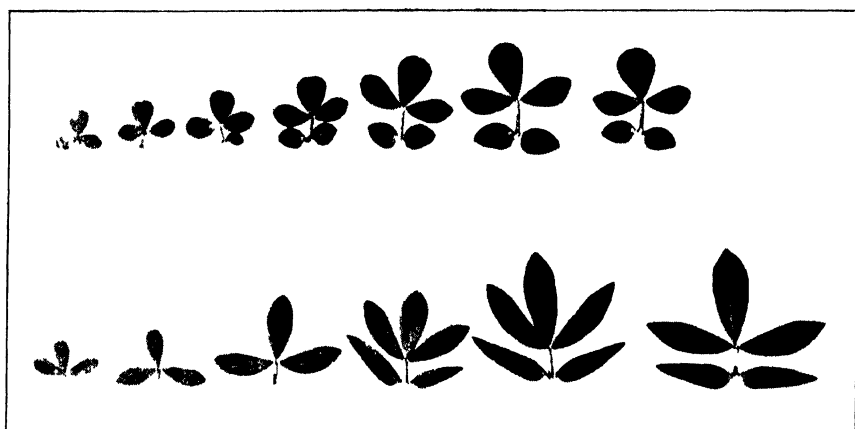


FIG. 3. (Top) The first seven leaves from a seedling of *L. Corniculata*, indigenous type
(below) The first six leaves from a seedling of *L. Corniculata*, narrow-leaved type



FIG. 4. Indigenous or dwarf plant of *L. Corniculata*, four months old
The diameter is nearly 12 cm in diameter

BIRDSFOOT TREFOIL

however, from observations made upon the Harper Adams College Farm, the herbage is appreciated by stock, and is stimulated by their urine. It is a very long-lived plant, and, on account of its deep, thick root-stock, is able to stand up to the driest conditions. It is a leguminous plant and its possible effect upon neighbouring grasses should not be overlooked. One hesitates to recommend its inclusion in large amounts in mixtures for permanent leys on account of the cost of the seed and the poor germination of much of the true indigenous type. On the other hand, the impurities met with in the indigenous type of seed are mostly the seeds of the useful species, and do not lower the value of a sample, except in so far as they represent seeds for which one does not wish to pay. It would be well worth while for graziers, with poor and hilly ground, to experiment on a small scale with this type of Birdsfoot Trefoil, using upwards of 1 lb. per acre. It is stated from a French source that the renovation of a pasture may be carried out by broadcasting 3-4 lb. of seed in February; snow and rain assist in burying the seed, which is also trodden in by sheep. Later, when the soil warms up, the seeds germinate.

(2) *The Erect Narrow-leaved Type* (var. *tenuifolis et tenuis*, Gaudien—*subsp. tenuifolius*, L.) has erect stems, and the leaflets are long, narrow and pointed. There is considerable variation between the leaves of different plants belonging to this type, and some of them are practically indistinguishable from the broad-leaved type. Even in the same plant, the first-formed basal leaves may be considerably broader in relation to their length than those higher up the stem. The seedling, however, is unmistakeable: it is much taller and there is a greater distance between the first two or three leaves than in the other types.

(3) *The Erect, Broad-leaved Type* has the same habit of growth as the Narrow-leaved type, but the leaflets are broader relatively to their length, so that the plant has a denser appearance. It is difficult to know what relationship this type bears to the others. Certain strains, obtained from experimental centres in Switzerland and Italy, were quite outstanding in respect of their erect habit and broad leaves; but, in the numerous strains under observation in the Botanical Garden at the Harper Adams College, all sorts of gradations and intermediate stages have been noticed. The more one studies the species, the more one realizes how very variable it is, although, as previously remarked, from

BIRDSFOOT TREFOIL

a practical point of view these three types exist.

The Narrow-leaved type forms the bulk of the commercial samples of *Lotus corniculatus*, but it is not a native of these islands. The references to Birdsfoot Trefoil in agricultural literature, since the days of William Ellis* (1774), apply usually to the dwarf, indigenous variety. Advocacy of the narrow-leaved variety mostly comes from certain districts of France, where its cultivation is stated to have increased very greatly since the War. In the Central regions of France the variety is even cultivated as a self-crop after the fashion of lucerne. Areas devoted exclusively to Birdsfoot Trefoil are known as "Lotières": they are formed, either by drilling the seed in rows 4-8 in. apart, at the rate of 9-12 lb. per acre, or by broadcasting from 10-18 lb. of seed. A nurse crop is used. Such Lotières are not common, since it has been found that better results can be obtained by sowing the seed mixed with one or two species of grass seed. Not only do the grasses support the comparatively weak stems of the leguminous plant, but they also keep down weeds that are encouraged by the slow growth of the trefoil seedlings. Typical seeds mixtures for forming a Birdsfoot Trefoil ley are (1) Birdsfoot Trefoil 9 lb., Cocksfoot 7 lb., Perennial Rye Grass 5 lb.; (2) Birdsfoot Trefoil 7 lb., Cocksfoot 7 lb., Tall Oat Grass 7 lb.

Bearing in mind the fact that Birdsfoot Trefoil would normally be used on the poorer types of soil, the yields obtained are of considerable interest. From French sources, the yield of green fodder, obtained in from 2-3 cuttings, has been estimated at from 6-15 tons per acre. In Danish experiments, the narrow-leaved variety has yielded more hay, over two harvest years, than red clover. The clover yielded more heavily in the first harvest year, but when the total amount of hay for the two harvest years was considered there was a difference of 31 per cent. in favour of the trefoil. In two Danish experiments, Birdsfoot Trefoil actually gave higher yields than lucerne: in three other instances the yield was 16 per cent. lower than that of lucerne.

On good ground in this country, there is no doubt that lucerne is much superior to Birdsfoot Trefoil. This has

* In Continental literature, it is frequently stated that the first writer to recommend Birdsfoot Trefoil as a crop plant was Worlidge in his *Systema Agriculturae*, published in 1681. From careful examination of this work it appears very doubtful that the plant identified as *L. corniculatus* by Continental writers was indeed that species. Reference to this and other points is made by the author in *Journal d'Agriculture pratique*, 29 juillet, 1933, No. 30, p. 91.

BIRDSFOOT TREFOIL

been repeatedly shown by the plots laid out in a Botanical Garden on a good loamy soil in this part of Shropshire. On the lighter sandstone soils, the position is not the same. Despite improvements in lucerne cultivation, and the preparation of superior cultures of root nodule organisms for seed inoculation, it cannot be claimed that the difficulties of growing lucerne in these districts have been satisfactorily overcome. A series of comparative experiments would be very instructive. A start has been made at Harper Adams College, where a small area has been sown down with a mixture of Birdsfoot Trefoil and Cocksfoot at the rate of 10 lb. of seed of each species per acre. The initial "take" of the leguminous plant was greatly superior to that of the red clover in the adjacent plots, and the trefoil area, after a very dry summer, thickened out and was, for a time, in marked contrast to the bare, thin areas sown down with a red clover mixture.

The claims put forward on behalf of Birdsfoot Trefoil are:—That it will grow satisfactorily on land too poor, too shallow, too impermeable, too deficient in lime, too full of alkaline salts, or too "sick" to support red clover or lucerne. It is not affected by dodder or broomrape. To obtain the best results from the plant, adequate supplies of potash, and particularly phosphates, are necessary.

Lotus major.—In the past the good points of this species have frequently been favourably commented upon by English writers, but the plant is almost completely neglected in this country. Its cultivation in the West of Germany and in New Zealand shows that, in special circumstances, it may be an extremely valuable addition to our leguminous crops. It is typically a plant of moist situations, and its greatest utility lies in its capacity for colonising, temporarily at least, marshy or peaty land where other legumes do not succeed. It grows between rushes and other undesirable plants, and, by its palatability, encourages closer grazing.* Farmers, on this type of land, might consider the possibility of broadcasting a pound or two of seed over their fields; or they might follow the Australian recommendation and sprinkle a handful of seed on top of each bag of phosphatic fertilizer as it goes into the manure box of the drill.

* See also Stapledon, this JOURNAL, Vol. XXXIV, p. 618, 1927.

THE STUDY OF AGRICULTURAL PRICES IN GERMANY

K. A. H. MURRAY, M.A., B.Litt., B.Sc., Ph.D.,
and V. CORNEA, B.Litt.,

*Agricultural Economics Research Institute, University of
Oxford.*

At the present time, price studies may be divided roughly into three categories according to their purposes:—

- (1) to provide the farmer with current market prices, so that he may buy or sell on as free a market as possible;
- (2) to acquaint the farmer with the market price situation, either currently or, if possible, in advance, so that he, individually, may attempt to co-ordinate his production or marketing with market requirements; and
- (3) in recognition of the resistance of agriculture to certain economic forces, to supply the information necessary to regulate and to "plan" the adjustment of production and consumption.

Although there has been an abundance of price data in Great Britain, although agricultural statistics have been used to a great extent as a background to economic history and economic theory, and although the principle and practice of statistical methods now in use were formulated chiefly in Great Britain, yet price analysis has not taken so large a place in systematic research here as it has in other countries. More rapid development of statistical price studies has occurred in the United States, and considerable headway has been made in Germany.

In many ways, conditions in Germany make the line of approach to the various agricultural economic problems more applicable to those of this country than do conditions in the United States. Germany has a fairly dense population; agricultural production is generally on a small scale, undertaken for the important industrial markets close at hand; and, normally, it is more of an importing than an exporting country as far as agricultural products are concerned. Only 25 per cent. of the gross income of farms is derived from crops, 62 per cent. being obtained from live-

AGRICULTURAL PRICES IN GERMANY

stock products and 13 per cent. from horticultural produce.*

The basis of all price studies is the collection and compilation of adequate, accurate, and representative price data. On these depend the farmer's knowledge of the market and also any further analysis.

The German system of price collection has its own characteristic features. Two main bodies are concerned with the collection and dissemination of agricultural prices:

- (1) The National Bureau of Statistics (Statistisches Reichsamt), and
- (2) The Union of Agricultural Chambers† (Deutsches Landwirtschaftsrat) which includes a special department for price statistics (Die Preisberichtsstelle).

As far as agricultural prices are concerned, the offices performed by the former correspond closely with those of the Statistical and Economics Branch of the Ministry of Agriculture in this country.

The collection of statistics by the "Preisberichtsstelle" is undertaken chiefly for advisory work to acquaint farmers with the current market price situation, and to help the individual farmer in buying and selling, rather than for the purposes of further price analysis. It obtains its data first hand from some 2,000 farmers in different parts of the country; the statistics are therefore almost unique in that they yield the prices received *on the farm* and not at some later stage in distributive channels. The value of these farm prices for analytical purposes is evident when it is recalled that it is the farm price that influences production just as it is the retail price that influences consumption. The data on sales and purchases are collected according to commodities, grouped into districts, and averaged, and a report is then sent back to the farmer giving his own price along with the average price for similar grades of a commodity within the area, the prices given by the different types of buyers, co-operatives, commission agents, brokers, breweries and the like, as well as estimates of production, numbers of live stock, farm stocks, production intentions and outlook information. The information is collected yearly, quarterly,

* "Agrarpolitik in Zahlen," *Deutsche Bauerschaft*, Berlin, 1932.

† The Union of the German Agricultural Chambers is a compulsory organization representing all the interests of agriculture; there are forty-one districts throughout Germany, each of which has a democratic election of representatives. The principal objective of the Landwirtschaftsrat tends towards the technical improvement of agriculture rather than political representation.

AGRICULTURAL PRICES IN GERMANY

monthly, weekly and, for some commodities, even daily. It is distributed at similar periods by means of special publications, news sheets, periodicals, the daily Press, telephone and radio.

The collection and dissemination of price statistics is but a small part of the purposes of price studies. Owing to the slow turnover in agriculture it is not enough to know the market situation at the time when production is first planned, but it is desirable to gauge in advance, if possible, the state of the market when the product is ready for sale. For this purpose and for the further end of price control, price analysis of the factors causing price fluctuations becomes essential.

The rapid adoption of statistical methods of analysis and their adaptation for economic data have increased the possibilities of accurate generalizations from past occurrences. Correlation analysis and its refinements have opened up the way to measure co-variation, although it is now recognized that the establishment of relationships is not in itself a sufficient basis for forecasting and that quantitative measurement is by no means final. Careful and logical reasoning, the distinction of cause and effect, the satisfactory explanation of time-lags and the like are now a complementary part of statistical price analysis. Both quantitative and qualitative analysis are integral parts of price studies.

There is neither time nor space to outline the various methods by which the study of agricultural prices is being undertaken in Germany. Before detailing one line of approach that appears to have a special significance in this country, a characteristic feature of the organization of German price research is worth noting—research on a commodity basis covering large marketing areas. Each particular commodity is then integrated into a larger industry, e.g., the live-stock industry, and this is placed within a larger unit, so that a general synthetic outlook is obtained. The most advanced studies are dealt with by bodies, constituted principally for specialized market research, such as the Reichforschungsstelle für Landwirtschaftliche Marktwesen, the Institut für Landwirtschaftliche Marktforschung, and the Institut für Konjunkturforschung.

For several years, price forecasting was the principal aim of many studies. The underlying object was the stabilization of price through the closer co-ordination of supply to

AGRICULTURAL PRICES IN GERMANY

market demand. The pig cycle, on which most work has been done, is an excellent example of the ill-adjustment of supply to demand. High prices, relative to costs, encourage production; the supply increases beyond what the market can absorb at a remunerative price; price falls; production is curtailed; and the supply falls to far below market requirements—so bringing back high prices and the recurrence of the cycle. It is claimed that the forecasting of production and prices, and the forestalling that results, evens out the extreme swings and brings about a closer adjustment.

This is not, of course, the only way of eliminating fluctuations and stabilizing prices, but it appears to be one of the most feasible.

The principle of providing the farmer with outlook information is being used widely in certain countries, with a fair measure of success, even though it is being tried at a time of extraordinary difficulty owing to the rapid decline in the general price level, with its attendant complications.

The importance attached in Germany to this aspect of the work is further indicated by the provision of quarterly enumerations of live stock in March, June, September, and December. Up to the present, these have been confined to pigs and to calves, but it is hoped to extend their scope in the near future in view of their success as a guide to future market supplies.

For example, every three months, forms are distributed asking for the numbers of pigs on the holding according to the following classification :—

- (a) Boars. 6 months to under 1 year.
1 year and over.
- (b) Sows. 6 months to under 1 year, pregnant.
1 year and over, pregnant.
, barren.
- (c) Other pigs. Under 8 weeks.
8 weeks to under 6 months.
6 months to under 1 year.
Over 1 year.
- (d) Pigs slaughtered on the farm in the stated three months.

Within a few days of the taking of the census, the results are available and distributed to the press throughout the country, with official reports on the price outlook. On the basis of these enumerations, the market supply can be forecast with remarkable accuracy, up to at least fourteen months ahead. The following figures give the forecast and

AGRICULTURAL PRICES IN GERMANY

actual pig populations during 1930, based on the December, 1929, census.*

Date.	Actual (in millions)	Forecast.	Percentage error.
June, 1930	19'8	19'6	1'0
September, 1930 ...	23'4	22'3	4'7
December, 1930 ...	20'9	20'9	0'0

The percentage errors, both for the total number of pigs and for the numbers in the individual classifications, are being gradually reduced as the factors causing them are discovered and discounted.

Where the time required to increase or decrease the supply is as short as it is with pigs, an annual census is of little significance. A contract system for a year ahead may be some guide as to what supplies may be expected on the market, but unless it covers the entire pig industry it is not very reliable. A quarterly census may be a surer guide to production plans.

Much of the more recent work on agricultural prices has been directed towards the analysis of the inter-relations of demand, supply and price through the use of demand curves. The aim of these demand curves is to indicate how the price of a commodity varies with the quantity available. The main problem is twofold: (a) to construct curves for any product to show how prices would vary with changes in supplies under existing conditions, and (b) to discover how these curves would change with alterations in the conditions affecting the demand for the product in question.

The solution of these problems becomes very important when regulation of commodity prices is the aim of the State or some body such as a producers' board. The State may determine to increase the production of some commodity to a certain volume; the question then arises, what price is necessary to bring forth that supply? A producers' board must calculate what price is necessary to move the available supply into consumption. Or, if it decides to fix its price by some other criterion, it must estimate how large a part of the supply will be taken at this price and how much must be taken off the market. Such estimates can

* Von der Warth: "Die Voransbestimmungen des Deutschen Schweinbestandes und der Schweineauftriebe." *Berichte über Landwirtschaft*, Sonderheft, 39, 1931.

AGRICULTURAL PRICES IN GERMANY

be made approximately by a rough and ready comparison of prices and supplies, but they can be obtained more accurately by the construction of demand curves.

The German workers have, in general, followed two main lines of approach—the historical study of the relationship shown between prices and supplies, and the study of consumers' budgets.

The study of past relationships between supplies and prices can show how price has varied as supply has changed, but in many instances supply has not been the only variable; alterations in demand may also have occurred. The most important causes of demand changes are found in the following:—

- (1) In general, purchasing power, including changes in the value of money, which may be considered as working through demand; these can be allowed for by correcting the price by some selected index of purchasing power.
- (2) In the purchasing power of those consuming the product.
- (3) In the prices of competing products.
- (4) In taste.
- (5) In the expectation of future price alterations.

By use of the graphical multiple correlation method, it is often possible to establish a relationship between prices, supplies and some index or indices measuring one or more of the above alterations in demand. If such a relationship can be established, it is possible not only to obtain the demand curve for the commodity in question under existing demand conditions, but also to show how it would fluctuate as the relevant demand factors alter. It must be admitted that some demand changes, such as the last two above, cannot be measured accurately, and, if these are important factors, then this method of deriving demand curves cannot yield very accurate results.

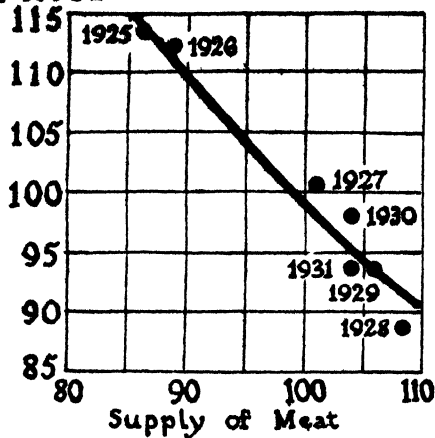
The use of multiple correlation methods is shown in a study by Hanau* showing the influence of supply and demand in determining meat prices. Taking the total consumption of pig meat, beef, veal, mutton and lamb as the supply factor and using wage earnings adjusted by a cost-of-living index as the demand factor, he established the relationships indicated in the diagram overleaf.

The upper left-hand diagram indicates the relation between supplies of meat and retail meat prices when the effect of changing incomes is eliminated; as supplies increase prices fall. The upper right-hand diagram shows the effect

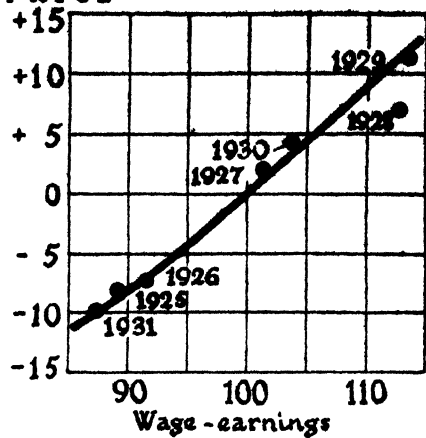
* Hanau, A.: "Auswirkungen des Wirtschaftskrise auf den Deutschen Fleisch und Schlachtviehmarkt." *Blätter für Landwirtschaftliche Marktforschung*, June, 1932.

AGRICULTURAL PRICES IN GERMANY

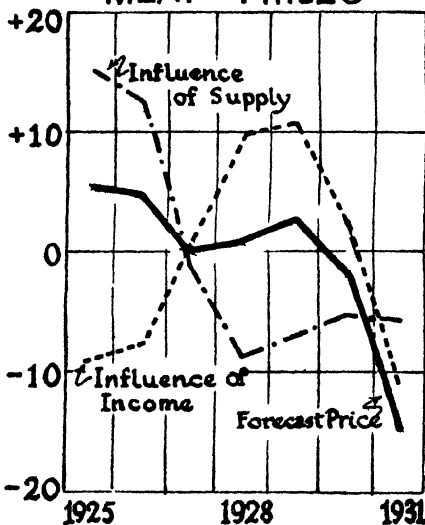
INFLUENCE OF SUPPLY
PRICE



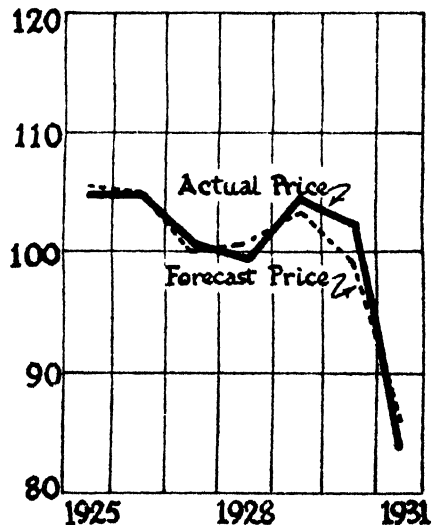
INFLUENCE OF INCOME
PRICE



INFLUENCE OF SUPPLY AND DEMAND ON RETAIL MEAT PRICES



FORECAST OF RETAIL MEAT PRICES



of changes in consumers' incomes on retail prices with the effect of alterations in supply eliminated as incomes rise, prices rise.

The lower left-hand diagram indicates for each year how retail prices of meat would have moved if affected:—

(1) By supply changes only, i.e., if consumers' incomes had remained at a normal level during the period studied. This line, the influence of supply, is derived from the upper left-hand curve showing the relationship between supplies and prices. For instance, in 1928, when supplies of meat were about 8 per cent. above normal, prices would be about 9 per cent. below normal.

AGRICULTURAL PRICES IN GERMANY

(2) By alterations in income only, supply being maintained at a normal level throughout. This line, the influence of income, is obtained from the upper right-hand curve showing the relationship between incomes and prices. For example, in 1928, when incomes were about 13 per cent. above normal, prices would be 10 per cent. above normal.

(3) By both supply and income alterations. This curve, the forecast price, is the sum total of the two other curves, the cumulative effect of supplies and incomes. Thus, in 1928, the supply situation alone would give a price 9 per cent. below normal, while the effect of income alone would give a price of 10 per cent. above. As a result the forecast price for 1928 was 1 per cent. above normal. In 1931, a "supply" price of 5 per cent. below and an "income" price of 10 per cent. below gave a forecast price of 15 per cent. below.

The lower right-hand diagram gives the forecast retail prices and the actual retail prices. The two lines diverge to a small extent owing to the fact that the actual prices are not explained entirely by the relationships studied, and that certain other factors have a slight influence.

Similar curves were constructed to indicate the influence of supplies and of consumers' incomes on wholesale meat prices, effects of different magnitude compared with those on retail prices.

From such curves, it was shown that the total expenditure on meat, considering all types of meat in the aggregate, moved in close relationship to the incomes of consumers; that a decrease in incomes was accompanied by a proportionately greater decrease in the consumer's expenditure on meat, since the more necessary items of expenditure in the consumer's budget take a greater proportion of the total income; that a still greater decrease occurred in the farm receipts for live stock as a result of decreased incomes owing to the more rigid costs of processing, manufacturing and distributing; that with decreasing purchasing power on the part of the consumer, prices can only be raised, or maintained, if the supply is decreased at a still greater rate. Not only were these relationships shown qualitatively but also quantitatively; e.g., how much supply must be reduced in the face of decreasing demand in order to maintain a stable income to farmers for live stock sold. The differences in the elasticity of demand for various meat products, beef, veal, mutton, pork, etc., and consequent difference in their price behaviour with varying supply conditions, suggest that further refinements in the supply analysis are necessary before a definite unifying policy could be adopted for the live-stock industry as a whole.

AGRICULTURAL PRICES IN GERMANY

The second method is to obtain the demand curves direct from consumers' budgets. This method overcomes the difficulty of measuring changing demand conditions by estimating demand curves from the different amounts consumed by persons of different incomes at any one time. Its advantages over the first method is that it can be applied when demand factors, not readily measurable, have a substantial effect on price.

The possibility of forming demand curves from data obtained direct from consumers' budgets is shown in a study by Bauer.* From the budgets of 2,000 families, labourers, employers, and civil servants, he estimated the relative elasticity of the demand for various foods. The coefficient of elasticity at different income levels was obtained as follows: if an increase of 1 per cent. in income raised the consumption of a commodity by 0.8 per cent. then the coefficient of elasticity would be +0.8. It would be unity if consumption changed to the same extent as income. If consumption decreased 2 per cent. as a result of a 1 per cent. increase in income, the coefficient would be -2. The following table gives some of the results of this study. Only

COEFFICIENTS OF ELASTICITY OF THE *PER CAPITA*
EXPENDITURE ON MEAT.

	Wage earners.			Salary earners.		
	700 Rm.	1350 Rm.	1800 Rm.	900 Rm.	1350 Rm.	2900 Rm.
Meat and meat products	0.93	0.79	0.68	0.87	0.74	0.05
Beef	0.87	1.15	1.27	0.81	0.74	0.34
Pig meat	0.72	0.67	0.58	0.66	0.58	-0.06
Veal	2.16	1.98	1.96	1.98	1.41	0.91
Mutton	-0.04	1.19	1.77	0.44	0.53	0.68
Minced meat	0.19	0.44	0.60	0.63	0.51	-0.52
Offals	0.31	0.90	1.21	0.96	0.86	0.49
Bacon, ham and other meats	1.17	0.71	0.40	0.65	0.66	0.21

in three instances is an increase in income accompanied by a decreased expenditure, for mutton in the lowest income group and for pig meat and minced meat in the highest income group. The highest elasticity indicated is for veal, where a 1 per cent. increase in income resulted in a 2.16 per cent. increase of expenditure on veal in the lowest income group, and 0.91 per cent. increase in the highest. The

* Bauer, Dr. W.: "Einkommen und Fleischverbrauch." *Vierteljahrshefte zur Konjunkturforschung*, Sonderheft 28, Berlin, 1932.

AGRICULTURAL PRICES IN GERMANY

expenditure on mutton in particular tended to increase as incomes increased among both types of consumers.

Similar data for rye, black bread, and potato consumption gave negative coefficients—the expenditure on these decreased with increased income.

The disadvantages of this method of approach are that it only gives the shape of the demand curve at any one time, and therefore cannot indicate how it would alter with demand fluctuations in time; that all types of consumers must be included and the collection of consumers' budgets is expensive; and that while the method can be used to compare the elasticity of the demand for two or more commodities, it cannot directly give the elasticity of demand for any one commodity. The fact, however, that it gives some guidance as to the behaviour of various types of consumers with conditions of changing purchasing power gives this method an important place in the study of agricultural prices.

These few examples of the price research work being carried on in Germany may serve to indicate some of the ways in which these studies aim at helping the farmer both directly and indirectly. They must form an integral part in the formation of an agricultural policy, since it is apparent that even the newest schemes are still relying on price to adjust production. They become all the more important when planning on the farm is to be supplemented by centralized planning, whether by producers' boards or by the State.

MARKETING NOTES

Pigs and Bacon Marketing Schemes.—The first Boards under the schemes went out of office on March 31, and were succeeded by Boards elected by the registered producers. The Pigs Marketing Board have appointed Mr. J. A. Fox as Chairman and the Earl of Radnor as Vice-Chairman of the Board, and these two members, with Mr. David Black*, represent the Board on the Wyndham Portal Committee. Mr. A. E. Marsh and Mr. J. F. Bodinnar continue in office as Chairman and Vice-Chairman, respectively, of the Bacon Marketing Board, and, together with Mr. Martin Lewis, represent that Board on the Wyndham Portal Committee.

Reference was made in the April issue of the JOURNAL (page 58) to a judgment, obtained by the Pigs Marketing Board against a registered producer, for £125 damages and costs in respect of a breach of contract to supply bacon pigs. Judgments have since been obtained for damages, assessed at £107 and £159, respectively, in two other cases.

The Bacon Marketing Board have submitted to the Minister and the Secretary of State for Scotland a number of amendments to the Bacon Marketing Scheme, 1933. The amendments are designed to enable the Board to implement the arrangements which have been provisionally agreed upon regarding the reimbursement to curers for losses, if any, which they may have sustained during the first contract period as a result of the operation of the schemes. The period for lodging objections in respect of the proposed amendments expired on April 28.

Results of Pig Grading.—The following table shows the grading results of pigs delivered under contracts during each month of the first contract period, November, 1933, to February, 1934:—

		<i>November.</i>	<i>December.</i>	<i>January.†</i>	<i>February.†</i>
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Grade A	..	4.9	5.2	8.4	11.9
.. B	..	20.1	22.0	25.7	28.7
.. C	..	18.8	19.9	19.7	16.6
.. D	..	33.2	31.0	27.1	22.9
.. E	..	3.2	2.6	2.4	1.8
Class 4 (Ungraded)		4.5	5.2	3.7	1.9
Ungraded but accepted by curers		7.8	8.3	8.5	11.9
Rejected		7.5	5.8	4.5	4.3
		100	100	100	100

† Grading results for January differ slightly from those given in the April JOURNAL as a result of a number of returns having been received late.

* Mr. Black's appointment by the Pigs Marketing Board as General Manager, at a commencing salary of £2,000 per annum, plus allowances, has since been announced. The appointment will create a vacancy on the Board.

MARKETING NOTES

The quality of pigs delivered showed a continuous improvement over the period. Grade A pigs rose to 11.9 per cent. in February compared with 4.9 per cent. in November. The percentages of pigs in the first three and the last two grades respectively were 57.2 and 24.7 in February. In November, the corresponding figures were 43.8 and 36.4. The number of pigs rejected by curers has fallen from 7.5 to 4.3 per cent. On the other hand, there was an increasing tendency to deliver pigs outside the classes contracted for, especially underweight pigs, and in February the percentage of pigs which curers accepted, though entitled to reject, was as high as 11.9.

Potato Marketing Scheme.—To ensure that all supplies of potatoes, allowed to come on to the market for human consumption for the remainder of the season, are properly graded, and to assist in establishing a better level of prices for producers, the Potato Marketing Board determined, on April 10, that potatoes of the varieties King Edward, Red King, Golden Wonder and Dunbar Cavalier should not be sold for human consumption unless they are dressed over a $1\frac{5}{8}$ in. riddle, or potatoes of any other variety unless they are dressed over a $1\frac{3}{4}$ in. riddle. Copies of the determination have been sent to every registered producer.

The Board may, by resolution, impose penalties on any registered producer who sells potatoes for human consumption in contravention of the determination.

Hops Marketing Scheme.—In consequence of an arrangement agreed to by the Hops Marketing Board and the Brewers' Society for the discussion of certain matters supplementary to the amendments to the Hops Marketing Scheme, 1932, which are now before Parliament, the Minister has appointed a Provisional Committee consisting of four representatives each of the Hops Marketing Board and the Brewers' Society, and three independent members. The membership of the Committee is as follows:—

Nominated by the Minister of Agriculture and Fisheries	{ Sir John R. Chancellor, G.C.M.G., G.C.V.O., D.S.O. F. D'Arcy Cooper, Esq. Capt. O. Lyttelton, D.S.O., M.C. Maj. C. M. Higgins, O.B.E., M.C.
Representatives of the Hops Marketing Board	{ G. H. Edwards, Esq. C. J. Elgar, Esq. S. May, Esq. Col. G. B. Winch
Representatives of the Brewers' Society	{ S. O. Nevile, Esq. F. Nicholson, Esq. Col. O. P. Serocold

MARKETING NOTES

The purpose of the Provisional Committee is to consider, in principle, the following matters:—

- (a) long-term planning in the production of hops;
 - (b) the fixation of the estimated total market demand for hops of each season;
 - (c) the determination of prices, with reference to (i) costs of production, (ii) the rate of profit to be fixed, having regard to the growers' willingness to accept a fixed rate provided the brewers agree to purchase not less than the quantity put forward as their firm requirements for the purpose of estimating the total market demand, (iii) the nature of the undertaking the Brewers' Society are able to give in this respect, and (iv) the marketability of the crop;
 - (d) the administration of the "levy fund," if such is agreed to be established; and
 - (e) any other relevant question which the Brewers' Society and the Hops Marketing Board may agree to refer to the Committee;
- and, having done so, to make recommendations regarding the composition, functions and machinery of a Permanent Committee to deal with these questions.

Sir John Chancellor is Chairman of the Committee and the Secretary is Mr. C. Burgess, of the Ministry, to whom communications should be addressed.

Milk Marketing Scheme.—The manufacturing price in respect of milk manufactured into cheese and butter has been fixed at $3\frac{1}{2}d.$ per gallon for April. The price for March was $3\frac{1}{4}d.$

Operation of the Scheme.—The wholesale contract price for March was $1s. 2d.$ per gallon in all regions. The price for the previous month was $1s. 4d.$ per gallon. The regional pool prices and rates of producer-retailers' contributions for March are given below. Figures showing the average monthly prices and rates of contribution during the winter contract period, October 6, 1933, to March 31, 1934, are given for comparison:—

Region.	Regional Pool Price.		Producer-Retailers Contribution.	
	Mar 1934	Average Oct.-Mar.	Mar	Average Oct.-Mar.
	(Pence per gallon)		(Pence per gallon)	
Northern ..	$12\frac{1}{4}$	13.67	$1\frac{9}{16}$	1.62
North-western ..	12	13.46	$1\frac{1}{2}$	1.78
Eastern ..	$12\frac{1}{2}$	14.04	$1\frac{1}{8}$	1.34
East Midland ..	$12\frac{1}{4}$	13.79	$1\frac{9}{16}$	1.59
West Midland ..	$11\frac{1}{4}$	12.96	$2\frac{9}{16}$	2.16
North Wales ..	12	13.04	$1\frac{3}{4}$	1.84
South Wales ..	12	13.37	$1\frac{1}{2}$	1.84
Southern ..	$12\frac{1}{2}$	14.04	$1\frac{1}{8}$	1.34
Mid-western ..	$11\frac{1}{2}$	13.17	$2\frac{1}{8}$	2.00
Far-western ..	$11\frac{1}{4}$	13.04	$2\frac{1}{4}$	2.16
South-eastern ..	$12\frac{3}{4}$	14.46	$1\frac{1}{8}$	1.41
Unweighted Average	12.02	13.55	1.73	1.73

MARKETING NOTES

The inter-regional compensation levy was continued at the rate of 1d. per gallon on all liquid sales. The whole of the proceeds of the levy (as against 85 per cent. in previous months) was distributed among the regions in proportion to their sales of manufacturing milk. The levy for the Board's expenses, including provision for liabilities and reserves, was again at the rate of $\frac{1}{4}$ d. per gallon on all sales of contract milk.

Result of Arbitration Case.—Shortly after the commencement of the Scheme, the Milk Marketing Board imposed a penalty of £50 on a licensed retailer, Mr. William Hollow, of St. Ives, Cornwall, for an alleged contravention of the terms of his licence by the sale of milk below the prevailing retail price of the district. The case was referred to arbitration, and was heard first in Cornwall, and later in London. The decision of the arbitrator has now been given in favour of Mr. Hollow.

Contracts for Semi-Wholesale and Accommodation Milk Sales.—Since the issue of the contract for sales of milk by wholesale, referred to in the Notes in the April JOURNAL, the Board has introduced two supplementary contracts dealing with (a) semi-wholesale sales to large-scale buyers such as hotels, hospitals and schools, and (b) sales of accommodation milk to producer-retailers holding retail licences issued by the Board.

In both these contracts, the level of prices is 1d. higher than the prescribed wholesale prices. There is provision for the addition to these prices of special service premiums agreed upon by the vendor and purchaser. The relevant terms and conditions of both contracts correspond with similar provisions in the contract for sales of milk by wholesale.

Wheat Act, 1932: Sales of Home-grown Wheat.—Wheat certificates lodged with the Wheat Commission from the commencement of the cereal year, on August 1 last, up to and including April 13, 1934, covered 23,631,518 cwt. of home-grown millable wheat. The quantity sold in the corresponding period a year ago was 16,470,000 cwt.

Third Advance on Account of Deficiency Payments.—On April 28, the Wheat Commission made a third advance to registered growers in respect of deficiency payments for the current cereal year. The advance was at the same rate as hitherto, namely 3s. per cwt., and was made in respect of applications received from registered growers on valid

MARKETING NOTES

wheat certificates delivered to the Commission after January 19 and on or before April 6. The sum so distributed was about £1,016,500, making the total of the advances paid to date in respect of the current financial year approximately £3,500,000. It is expected that a fourth advance will be made in July, in respect of sales made after April 6.

British Sugar Industry: Committee of Inquiry.—The Chancellor of the Exchequer has appointed Sir Kenneth Lee and Mr. Cyril Edward Lloyd as the remaining members of the Committee of Inquiry under the Chairmanship of Mr. Wilfred Greene, K.C., to which reference was made in the April JOURNAL (page 60). The Secretary of the Committee is Mr. S. Caine, of the Colonial Office, with Mr. C. Burgess, of the Ministry, as Assistant Secretary.

Draft Sugar Marketing Scheme, 1934.—The Public Inquiry into objections to the draft Sugar Marketing Scheme opens at the Middlesex Guildhall, Westminster, on May 1. The Inquiry is being held by Mr. Joshua Scholefield, K.C., the Commissioner appointed by the Minister and the Secretary of State for Scotland.

Committee of Investigation for England.—The Minister has referred to the Committee a complaint by the National Association of Creamery Proprietors against the operation of the Milk Marketing Scheme. The Committee gave the Association and the Milk Marketing Board leave to appear and submit evidence before them. The hearing began on April 26.

Regulation of Supplies : (i) Irish Free State Cattle.—Arrangements have been made to continue, during the second quarter of 1934, the issue of licences under the Cattle (Import Regulation) Order, 1933, on the same quantitative basis as in the first quarter. Imports of fat cattle from the Irish Free State will thus be limited to 50 per cent. of the numbers imported in the second quarter of 1933, and imports of store cattle, dry cows and bulls showing permanent incisor teeth, will not be allowed to exceed the numbers imported in that quarter. Imports of cows in milk, cows and heifers in an advanced state of pregnancy, and calves under six months old, are not subject to regulation under the Order.

(ii) Meat.—Under the Ottawa Agreements Act, 1932, imports of frozen beef (carcasses and boned beef) and

MARKETING NOTES

frozen mutton and lamb from foreign sources, which have been reduced by stages since the beginning of 1933, are being further reduced during the present quarter, when they will be 35 per cent. below the quantities imported in the corresponding quarter of 1932. Under voluntary arrangements, imports of chilled beef from foreign countries are being reduced by $3\frac{1}{2}$ per cent. as compared with imports in the second quarter of 1932. This represents a slightly larger reduction than in the second quarter of 1933.

(iii) *Bacon and Hams*.—As reported in the April issue of this JOURNAL, the quantity of bacon estimated to be produced in Great Britain, during the period March 1 to December 31, 1934, on the basis of pig contracts signed by producers, and pigs to be produced by curers themselves, is 1,701,030 cwt. In addition, it is estimated that a quantity of 68,000 cwt. of bacon will be produced by small curers, exempt from the provisions of the Bacon Marketing Scheme, and from parts of small pigs of weights below those specified in contracts. The estimated bacon output of Northern Ireland during the ten months, together with the bacon equivalent of pigs shipped from Northern Ireland for curing in Great Britain, is 484,300 cwt., excluding bacon made from Irish Free State store pigs fed in Northern Ireland. The estimated output of bacon in the United Kingdom in the period March 1-December 31, 1934, is thus 2,253,330 cwt.

In pursuance of the policy of stabilizing total United Kingdom supplies of bacon and hams at the level recommended by the Lane-Fox Commission, the quantities of bacon and hams, and of pigs and pork for curing, to be imported in the ten months period has been fixed at 6,773,700 cwt. Total imports from the Dominions are expected to amount to 1,340,400 cwt. in terms of bacon weight. The balance of 5,433,300 cwt., which includes provision for 13,000 cwt. of frozen pork to be imported from the United States and Argentina for curing in this country, has been allocated to foreign countries.

In order to secure an even and adequate monthly distribution of total supplies, allocations have been made to foreign countries at a higher rate for the five months, March to July, than for the five months, August to December. The distribution of permitted imports of bacon and hams (including canned bacon and hams and salt pork) among foreign supplying countries is as follows:—

MARKETING NOTES

Country	Five Months March—July, 1934	Five Months August—December, 1934
	cwt.	cwt.
Denmark	1,824,120 ^a	1,596,010
Holland	259,525	238,770
Poland	223,525	199,815
Sweden	126,880 [†]	118,130
Lithuania	88,880	74,145
Estonia	20,950	18,850
Finland	11,435	10,055
Latvia	17,920	17,595
U.S.S.R.... ..	21,325	21,365
Argentina	19,115	17,595
U.S.A.	209,225 [‡]	201,070 [‡]
Other countries ..	40,000	44,000
Totals	2,862,900	2,557,400
	5,420,300 [§]	

* Includes an adjustment due to Denmark in respect of the period September 15, 1933, to February 28, 1934.

† Subject to an addition of 1,290 cwt. for the period March 1-28, 1934.

‡ Subject to a small addition in respect of adjustments in connexion with imports through Canada.

§ Subject to deduction, in the case of certain individual countries, in respect of over-shipments in the period November 10, 1933, to February 28, 1934.

The Bacon (Import Regulation) Order, 1934.*—The Board of Trade have made an Order, under Section 1 of the Agricultural Marketing Act, 1933, revoking the Bacon (Import Regulation) Order, 1933, and substituting for it a new Order, entitled the Bacon (Import Regulation) Order, 1934.

The main provisions of the 1933 Order are reproduced in the new Order, and no change is made as far as imports from the main foreign supplying countries are concerned. The changes concern foreign countries supplying only small quantities of bacon, imports from which are left unregulated so long as they do not exceed a rate of 400 cwt. a week, and they are designed to put a stop to the practice that has grown up in some of these countries of exporting to this country bacon produced from pigs and carcasses imported from other foreign countries.

Since April 16, 1934, when the Order came into force, bacon imported from foreign countries must be accom-

* *Statutory Rules and Orders, 1934, No. 344*, obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1d. net, post free 1½d., or through any bookseller.

MARKETING NOTES

panied by a certificate stating not only the country of origin of the bacon, but also that the pigs from which it was made were bred in the same country. Countries scheduled in the Order already comply with this requirement.

Potatoes.—It was stated in the February, 1934, issue of this JOURNAL (p. 1060) that, following upon recommendations from the Market Supply Committee, arrangements were being made for the regulation of imports of main-crop potatoes into the United Kingdom during the four months, January-April of this year, while the position with regard to the regulation of imports of early potatoes in the 1934 season was under consideration.

Arrangements as finally made in respect of main-crop potatoes provided for maximum imports from the Netherlands of 8,000 tons during the four months, January-April, 1934, while other foreign countries were asked to refrain from exporting to the United Kingdom market during the same period.

With regard to early potatoes, an announcement was made by the Minister, in the House of Commons on March 27, in the following terms, in reply to a question by Colonel Ruggles-Brise, the Member for Maldon:—

“As my hon. and gallant Friend will be aware, the assistance afforded to the potato industry by Customs duties has been supplemented, since August last, by voluntary arrangements for regulating the supply of main-crop potatoes from foreign countries. These arrangements appear to have been fully observed and to have worked well, and have been generally appreciated by home growers. The question whether similar action should now be taken in regard to the supply of foreign early potatoes has been examined by the Market Supply Committee, in the light of the general supply situation and the low level of prices now ruling. Pending the framing of a permanent plan, it has been decided, after consultation with the Potato Marketing Board, that exporting countries should be invited to help the general situation by securing that their shipments of early potatoes to this market are held at last year's level. The foreign Governments concerned are being approached accordingly.”

Bacon Development Scheme.—A scheme under the Agricultural Marketing Act, 1933, for organizing, in con-

MARKETING NOTES

nexion with the Pigs and Bacon Marketing Schemes, the production of bacon in Great Britain, has been submitted to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland.

Copies of the scheme may be obtained, on payment of twopence per copy (post free), from the Pigs Marketing Board, Thames House, Millbank, London, S.W.1., the Bacon Marketing Board, at the same address, or the Scottish offices of the Pigs Marketing Board or the Bacon Marketing Board, situated respectively at 124, St. Vincent Street, Glasgow, C.2, and 105, St. Vincent Street, Glasgow, C.2. Copies of the scheme may be inspected, on personal application, at any of the before-mentioned addresses (except on public holidays) from Monday to Friday inclusive, between the hours of 10 a.m. and 5 p.m. and on Saturday between the hours of 10 a.m. and 12 noon.

Any objections and representations with respect to the scheme should be made to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland and addressed to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, the Under-Secretary of State for Scotland, Scottish Office, Whitehall, or the Secretary, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh, so as to reach them not later than May 23, 1934; objections received after that date will not be considered. Every objection and representation with respect to the scheme must be made in writing and, in the case of objections, the grounds of objection should be stated.

National Mark Beef.—The number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during January, February and March, 1933 and 1934, and the three weeks ended April 21, 1934, were as follows:—

LONDON AREA				
	<i>Home Killed</i>	<i>Scotch Sides for London</i>	<i>Scotch Sides marked at Smithfield</i>	<i>Total</i>
Jan. 1933	10,981	5,015	5	16,001
" 1934	9,964	6,632	—	16,596
Feb. 1933	7,986	4,674	4	12,664
" 1934	7,514	6,057	—	13,571
Mar. 1933	8,740	5,145	5	13,890
" 1934	8,075	6,668	—	14,743
Three weeks ended April 21, 1934	5,914	4,465	—	10,379

MARKETING NOTES

BIRKENHEAD AREA

(including Liverpool)

	<i>For London (included under Home-Killed in London Area)</i>	<i>Liverpool (for local requirements)</i>	<i>Total</i>
Jan. 1933	3,066	—	3,066
" 1934	3,324	1,115	4,439
Feb. 1933	1,755	—	1,755
" 1934	2,001	1,233	3,234
Mar. 1933	2,357	—	2,357
" 1934	1,933	1,303	3,236
Three weeks ended April 21, 1934	1,431	867	2,298

BIRMINGHAM AND YORKSHIRE AREAS

	<i>Birmingham</i>	<i>Leeds</i>	<i>Bradford</i>	<i>Halifax</i>
Jan. 1933	5,172	2,396	1,906	440
" 1934	5,532	2,315	1,836	481
Feb. 1933	5,363	1,868	1,418	327
" 1934	4,904	1,980	1,608	377
Mar. 1933	4,510	1,850	1,581	373
" 1934	4,909	2,190	1,608	465
Three weeks ended April 21, 1934	2,745	1,565	1,182	337

On January 15, arrangements were made for including Liverpool in the Birkenhead National Mark Beef area. This arrangement has met with considerable success, and has made possible the fulfilment of contracts for National Mark Beef, placed by the Liverpool Shipping Companies.

National Mark Cheshire Cheese.—Since the inception of the National Mark Cheshire Cheese Scheme, the whole of the output of graded farm-made Cheshire Cheese, made by members of the Cheshire Cheese Federation, has been marketed under the National Mark.

The numbers of such cheese graded and marked to the end of March are as follows:—

<i>Quarter Ended</i>	<i>Number of Cheese Graded.</i>		
	<i>Extra Selected</i>	<i>Selected</i>	<i>Total</i>
January, 1934	10,678	4,253	14,931
March, 1934	578	3,974	4,552
Total ...	11,256	8,227	19,483

During the last quarter, 3,026 factory-made Cheshire cheese weighing 1,342 cwt. 80 lb., were also graded and marked with the National Mark at the factories of two of the four manufacturers now authorized in the Scheme.

Investigations into the Blue-veining of Cheese.—The Ministry has sanctioned a special grant for the purpose of

MARKETING NOTES

enabling an investigation to be made by the National Institute of Research in Dairying into the factors that influence the "blueing" of English cheese, one of the important quality characteristics that needs to be taken into account in formulating National Mark Schemes for Stilton and Wensleydale cheese. This research aims primarily at ascertaining the conditions necessary to produce a successfully "blued" cheese characteristic of the particular variety.

Marketing Demonstrations.—The Ministry will give Marketing Demonstrations at the following Agricultural Shows during the forthcoming season. As announced in the April issue of this JOURNAL, the Marketing Boards will be represented in the Ministry's pavilion at a number of the more important shows. Another interesting feature at certain shows will be an exhibit by the British Broadcasting Corporation. At all shows a cinema will be attached in which National Mark and other marketing films will be shown.

<i>Date.</i>	<i>Show.</i>	<i>Nature of Exhibit.</i>
May 22-24	Devon County, Newton Abbot.	National Mark. Apple Grading demonstration. Milk, Pigs and Bacon Marketing Boards. B.B.C.
„ 30-June 2	Bath and West, Oxford.	National Mark. Tomato Grading demonstration. Milk, Pigs, Bacon and Potato Marketing Boards. B.B.C.
June 6-9	Royal Counties, Salisbury.	National Mark. Egg Grading demonstration. Milk, Pigs and Bacon Marketing Boards. B.B.C.
„ 8-9	Northamptonshire, Kettering.	National Mark. Onion Grading demonstration.
„ 12-14	Three Counties, Hereford.	National Mark. Apple Grading demonstration. Milk, Pigs, Bacon and Potato Marketing Boards. B.B.C.
„ 13-14	Royal Cornwall, Camborne.	National Mark. Pigs and Bacon Marketing Boards.
„ 20-21	Sussex, Brighton.	National Mark. Egg Grading demonstration. Milk Marketing Board. B.B.C.
„ 20-22	Lincolnshire, Gainsborough.	National Mark. Potato Marketing Board.
„ 26-28	Peterborough.	National Mark. Onion Grading demonstration. Potato Marketing Board. B.B.C.
July 3-7	Royal Agricultural Society, Ipswich.	National Mark. Egg Grading demonstration. Milk, Pigs, Bacon and Potato Marketing Boards. B.B.C.

MARKETING NOTES

<i>Date.</i>	<i>Show.</i>	<i>Nature of Exhibit.</i>
July 4-7	Aldershot Show.	National Mark Display.
„ 10-12	Great Yorkshire, Bradford.	National Mark. Tomato Grading demonstration. Milk, Pigs, Bacon and Potato Marketing Boards, B.B.C.
„ 12-14	Kent County, Ashford.	National Mark. Apple Grad- ing demonstration. Pigs and Bacon Marketing Boards.
„ 18	Northumberland, Morpeth.	National Mark. Egg Grad- ing demonstration. Milk Marketing Board.
„ 18-19	Warwick, Coventry.	National Mark. Tomato Grading demonstration. Milk Marketing Board.
„ 25-27	Royal Welsh, Llandudno.	National Mark. Milk, Pigs, Bacon and Potato Market- ing Boards, B.B.C.
Aug. 2-6	Royal Lancs., Bolton.	National Mark. Egg Grad- ing demonstration. Milk, Pigs, Bacon and Potato Marketing Boards. B.B.C.
„ 6	Durham County, Sunderland.	National Mark.
„ 9	Tring.	National Mark. B.B.C.
„ 9	Bakewell (Derbyshire).	National Mark. Egg Grading demonstration.
„ 22-24	Southport Flower.	National Mark. Tomato Grading demonstration.
„ 30	Sandy (Beds.) Horticultural.	National Mark Vegetables.
Sept. 5	Vale of Glamorgan, Cowbridge.	National Mark. Milk Mar- keting Board.
„ 6	Dorchester.	National Mark. Egg Grading demonstration.
„ 19	Altrincham	National Mark. Tomato Grading demonstration.
„ 20	Thame.	National Mark.

Publicity for National Mark Products—The National Mark shopping campaign in Bexhill-on-Sea will be formally opened by the Rt. Hon. Viscount Hailsham, Secretary of State for War, at a public luncheon in the Sackville Hotel, Bexhill, on Monday, May 14, at 1 p.m. The campaign will continue during the ensuing fortnight. Earl De La Warr, Parliamentary Secretary to the Ministry of Agriculture and Mayor of Bexhill, will preside at the luncheon, tickets for which may be purchased, price 5s., from Mr. E. Rhodes, Secretary of the local National Mark Committee, The Colonnade, Bexhill.

National Mark Flour Cookery Competition.—Judging in this inter-county competition for Women's Institutes took place at the Crystal Palace on March 14, when the Lancashire Federation were declared the winners, with

MARKETING NOTES

Somerset and Devon as runners-up. A number of letters has since been received by the Ministry from members of the successful teams, expressing their satisfaction with the results obtained by using National Mark flour; they found the texture, appearance and flavour of the bread and cakes most pleasing, while the flour proved easy to work.

Publicity for Home-grown Flowers and Plants.—As announced in the March issue of this JOURNAL, the Minister of Agriculture appointed, in February last, a committee—known as the Flowers and Plants Publicity Committee—to advise the Ministry upon the measures to be taken, *inter alia*, for giving wider publicity to, and increasing the demand for, home-grown bulbs, plants, trees, shrubs and cut flowers. In accordance with this Committee's recommendation, the Ministry has approached the authorities of a number of the principal industrial cities and seaside resorts, with a view to enlisting their practical support of the "Buy British" policy. The replies so far received have been favourable.

Promises of co-operation have already been given by a number of south-coast resorts that have been visited by an officer of the Ministry. Certain of them already purchase only British-grown plants and shrubs; but, up to the present, the position has not been so favourable as regards bulbs. As a result of the Ministry's representations, however, the local authorities concerned have now agreed to invite firms to tender for the supply of varieties of bulbs that are grown commercially in this country. It is expected that the margin between the prices of British-grown and Dutch bulbs will lessen as regards supplies for the coming season, and so encourage local authorities and others to purchase the home-grown product.

All the authorities approached have intimated their readiness to make use of standardized "British grown" labels in connexion with their displays of tulips, roses and flowering shrubs, which will be a feature in their parks and gardens during the coming summer. If a sufficient demand for such labels is forthcoming, the Ministry proposes to provide supplies free of charge.

As opportunity offers, industrial centres and other seaside resorts will be visited with a view to increasing the demand for the home-grown horticultural products with which the Committee is concerned.

MAY ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington.

MAY is the real month of transformation from winter to summer conditions. In the Eastern Midlands, the showers of April in the average year give place to a slightly heavier rainfall in May, though completely fine days are usually more numerous. The sunshine records show very little change from April, but ground frosts are almost negligible. In recent months, the weather has been far from normal, and there is a pronounced feeling among agriculturists that anything may happen this year. At the time of writing, the whole country is experiencing a continuation of drought conditions. It is too early to forecast what effect the dry winter is likely to have on this year's cropping prospects. The chief problems at the moment concern the conservation of water supplies for farm stock as well as the population generally. Apart from these considerations, a dry winter has no serious consequences for agriculture. Thus vegetation is never very active in winter, while arable operations in particular are favoured by dry weather. This latter fact has been particularly emphasized during recent months, and most excellent tilths have been obtained for sowings of spring cereals. Live stock, too, are appreciative of dry weather, particularly where out-wintering is practised. This not only concerns cattle, but applies with equal force to sheep. In the present season, early-dropped lambs have made excellent progress.

One or two consequences of general interest arise from the fact that the dry summer of 1933 was followed by a dry winter. Thus, it is highly probable that, when normal rainfall is resumed, grass land in particular will be highly productive, since the fertility residues of the previous grazing season have not been subjected to the normal winter leaching. Working on this assumption, the writer has not applied nitrogenous top-dressings so extensively to grass land this spring. Indeed, working on probabilities, it is anticipated that the early growth will be satisfactory without the aid of nitrogenous top-dressings in the first part of the

season, but that top-dressings will be useful after the first flush of growth has been eaten down. It might be equally argued that the fertility of arable land should be correspondingly high this year. With this there are more factors than one, however. Thus, winter-sown wheat is not uniformly good. In many instances, the explanation is that the seed-bed has lacked sufficient firmness, for few things are worse than a hollow seed-bed in a dry winter.

The Bacon Pig.—The experiences of the first four months of the official contracting period under the bacon scheme have served to emphasize many of the difficulties that arise in connexion with breeding and feeding. It is too early to be dogmatic on the question of bacon pig type. There are more factors than breed alone involved, but, if relative popularity is any sound criterion, then the Large White breed must be rapidly becoming the main standby of the home bacon market. There is, however, a wide difference amongst Large Whites with regard to their suitability for bacon production. The evidence that is beginning to accumulate, from litter-recording and the observation of litter behaviour under the bacon-grading scheme, is already proving useful as a guide to the most suitable strains. The future of bacon-pig breeding will be more closely linked-up with strains developed on this basis, and pedigree breeders cannot afford to neglect this aspect in the selection of gilts and boars. In attempting to define suitable bacon type, in the light of existing grading standards and requirements, it appears to be necessary to concentrate on a fine-shouldered pig with great length of side, and yet having firmness or levelness of belly. Cross-breeding is particularly popular with commercial breeders, and almost without exception the Large White breed supplies the sire, while the most popular dams are of the Large Black, Wessex and Middle White breeds. The Large Black sow has very wide support in the Midlands, but it is interesting to note that breeders of cross-bred pigs are particular in producing pigs with blue markings rather than distinctive black and white pigs. This capacity for producing blue-marked pigs is apparently dependent upon the Large White boar employed, and to the breeder of pigs destined to enter the store market, a proved "blue-getting" Large White boar is considered an essential in the Midlands. The cross that has been practised with considerable success on the Midland College Farm is that between the Large and Middle White

MAY ON THE FARM

breeds. This must be regarded as essentially a dual-purpose type, suitable for the large pork trade of the Midlands and for Class I under the bacon scheme. It has to be recognized, however, that some of the pigs of this cross tend to get too fat on the shoulder, but invariably they produce good bellies. It is the writer's experience that the cross-bred Large White-Middle White, used as a breeding sow, makes one of the best breeding pigs for bacon purposes, especially when again mated with the Large White breed.

Of the practical points that arise with regard to the supply of bacon pigs for the various classes, none is more important than sending to the curer pigs of a weight up to the standard required. The data collected under the East Anglian Pig Recording Scheme indicates the following range of weights for the various classes:—

<i>Live weight on the farm. lb.</i>	<i>Loss on killing. per cent.</i>	<i>Dead weight cold. lb.</i>	<i>Class.</i>
197	28.9	140	Class I
236	27.9	170	
237	27.9	171	
260	26.9	190	Class II
261	26.8	191	
281	25.2	210	Class III
282	25.1	211	
291	24.4	220	Class IV

It is necessary to emphasize, at the outset, that pigs can only be selected with certainty by the weighbridge, and it therefore becomes necessary to take a more intelligent interest in weights. The data that have accumulated with regard to this on the Midland College Farm, for the contracting period November, 1933, to February, 1934, are appended:—

	<i>Hogs.</i>	<i>Gilts.</i>
Number sent to curers	53	56
Average live weight on farm ..	213 lb.	215 lb.
Average dead weight at factory ..	153 lb.	155 lb.
Average killing (percentage) ..	71.8	72.2
Average age	210 days	208 days
Age of youngest pig	181 days	166 days
Age of oldest pig	240 days	243 days

The average figures agree very well with the East Anglian data, but although, in no case, were pigs of under 200 lb. live weight on the farm sent to the curer, yet three pigs of 200 lb., one of 201 lb. and one of 202 lb., failed to reach Class I dead weight standards. It should be explained that the pigs in question were sold to a firm of curers whose

MAY ON THE FARM

premises were some 50 miles distant from the College, so that the pigs had a cross-country railway journey. In the present contract period (March-December) the pigs are being sent to a local curer, and the March figures give distinctly better killing percentages, while the 200 lb. live weight can be regarded with greater safety than when pigs are to be sent some distance.

Grass Land.—May is generally regarded as one of the critical months in the management of grass land. May-day has for long been associated with the turning out time as grass-day, but in old farming practices this referred to the 13th and not the 1st of the month. This year, there has been very little early growth of grass, even on pastures treated with nitrogenous top-dressings, while snow and cold winds in April have served to remind one of the uncertainties of planning for early grazing. It is being increasingly appreciated, as the outcome of modern research, that there are more factors than appropriate manuring involved in the maintenance of good grazing. Thus, in trials at Jealott's Hill, Martin Jones [vide *Empire Jour. Exp. Agric.*, Vol. I, and *Jour. R.A.S.E.*, 1933] has demonstrated that grazing control at different periods of the year materially affects the composition of the herbage in respect of species. Emphasis is now placed on the necessity of avoiding overgrazing in early spring so as not to weaken the early-maturing species of herbages, and of allowing occasional rests for recuperation of the grazing during the season. Both these suggestions have been followed for many years by good graziers, but it is perhaps not so generally appreciated that control of this kind may transform a second-rate pasture into something distinctly better.

The evidence supplied by the Jealott's Hill plots has led Martin Jones to suggest that controlled grazing is a cheaper method of pasture improvement than the frequently advocated policy of ploughing-out and reseedling. Grazing control is often out of the question by reason of defective fencing of fields, but it should be realized that, apart from the effect on the herbage, stock never seem to do so well if they have the complete run of the farm.

The constant applications of counsels of perfection is not always possible in farming practice, if only because no two seasons are alike, and grass-growth is usually determined by the season. The problems of stock-carrying capacity are increased by the variations that arise from seasonal

MAY ON THE FARM

factors, but it is an old Leicestershire axiom that the grass that grows in May should be eaten in May. This was regarded as the best method of preventing the grasses from running to seed prematurely, but in these days the mowing machine can be employed for topping purposes on overgrown pastures.

Of the particular problems that arise when dairy cows are turned out to grass, it is important to realize the need for gradual acclimatization. Adequate ventilation of cowsheds is now more widely recognized than formerly, and one of the advantages of a cool cowshed is that the cows suffer less from chills when turning-out time arrives. Nights are still apt to be chilly, and cows in full milk should not be expected to give of their best if unduly exposed.

Arable.—May is equally critical for arable land operations. Root breaks claim the greatest attention in respect of the late drilling of mangolds, sugar-beet and kales. The type of weather experienced this month plays a great part in determining successful takes of root crops. A period of cold, wet weather retards germination, and may cake the ground. Mild, damp weather, while facilitating germination is equally beneficial to the competing weed population. From this month onwards, the battle with weeds commences in earnest, and the early use of the horse hoe is particularly desirable. It is sound practice to get on level terms with weed-growth at the beginning of the season, since it simplifies work later in the season and makes singling easier and more effective. Early singling has been more appreciated since the sugar-beet crop has become established. What applies to sugar-beet applies equally to mangolds in respect of a larger weight of crop per acre. There is no particular point in very close thinning. Regular width is of greater importance.

Marrow-stem kale is one of the few crops that can be left to take care of itself, apart from the early hoeing. There are sufficient experimental data to prove that the unthinned kale gives a heavier crop per acre than the thinned, while the smother action on weeds is so complete with this crop that it is definitely economical in labour operations. It is to be remarked, however, that thinned kale is easier to cut and handle than the unthinned, and this deserves some consideration.

Potatoes demand little attention apart from the harrowing down of the ridges before the plants appear through the

PRICES OF ARTIFICIAL MANURES

ground—although in some cases planting of maincrops continues into May. Late planting is rarely as satisfactory as early planting.

Maize has not made progress in this country to the extent that it might have done, but seedings of this crop can be safely made in the third week of the month. Early-maturing varieties are now available for sowing and will produce maize in the cob by the middle to the end of September. The French Jaune Gros is particularly suitable in this respect, though the American forage varieties are probably heavier croppers.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended April 11				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	7 18d	7 18d	7 18d	7 18d	10 2
" " Granulated (N. 16%) ..	7 18d	7 18d	7 18d	7 18d	9 9
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20·6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium cyanamide (N. 20·6%) ..	7 5e	7 5e	7 5e	7 5e	7 0
Kainit (Pot. 14%) ..	3 6	3 0	2 17	3 0g	4 3
Potash salts (Pot. 30%) ..	5 4	5 1	4 17	5 0g	3 4
" " (Pot. 20%) ..	3 15	3 9	3 6	3 10g	3 6
Muriate of potash (Pot. 50%) ..	9 8	9 1	8 15	9 2g	3 8
Sulphate, " (Pot. 48%) ..	10 12	10 7	10 0	10 7g	4 4
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26·27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16k	3 6
" " (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	7 15	6 17	6 15f	6 7	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 5	5 12	5 12f	5 7	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid
Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

e Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails; southern rails, 1s. 9d. extra.

NOTES ON MANURING

J. HUNTER SMITH, B.Sc., C. E. HUDSON, N.D.H., and
H. W. GARDNER, B.A.

Herts Institute of Agriculture, St. Albans.

Manuring of Root Crops.—The recommendations for manuring most of the agricultural root crops have been fairly constant for several years—a good basal dressing of farm-yard manure reinforced with rapidly-acting artificial fertilizers. For mangolds it has usually been advised that the nitrogen should be moderate in amount and be divided into two dressings, half with the seed and half (as nitrate) after singling; phosphate also in medium quantity, and usually as superphosphate; potash has been regarded as of greater importance, and because of the possible value of salt for this crop, it is usually applied in the form of crude salts (formerly as kainit, now better and cheaper as 20 per cent. potash salts).

For swedes, phosphate is the important addition to dung, usually applied as superphosphate, but in some districts as basic slag or finely-ground mineral phosphate.

For potatoes, for which there can be little doubt of the value of a complete fertilizer in addition to dung, the tendency during the past ten years has been to place greater emphasis on potash and less on phosphate. Possibly this tendency has gone just a little too far and it would be wise, while maintaining the level and balance of nitrogen and potash, to keep up the supply of superphosphate also.

For sugar-beet in this country there is no long tradition, and the manuring has usually resembled that for mangolds, except that rather more nitrogen has been given and autumn application has been advised for the dung. The chief deduction from recent experimental work is that the splitting of the nitrogen fertilizer (based on analogy with mangolds) is unnecessary and that equally good results are obtained by putting all into the seed bed. The following extract from the review, by Sir John Russell, of "Soils and Manures" in the *Journal of the Royal Agricultural Society of England*, 1933, are of interest:—

"Sugar-beet presents some of the most difficult problems in modern agriculture. The average yield in England at the present time is only 8·5 tons per acre; this is too low for a successful industry,

NOTES ON MANURING

and it appears to be unnecessarily low because many growers obtain 13 and 14 tons per acre, and there seems no reason why the average should not be raised to exceed 10 tons per acre. Mere variations in the proportions of the fertilizers afford no prospect of solving the problem: something more is needed which, however, has not been definitely determined."

He then summarizes the results of seven years' work conducted by Rothamsted at various centres. This summary shows that nitrogen produced increases of weight of roots in 62 per cent. of the total number of trials, potash in 39 per cent., phosphate in 16 per cent., and common salt in 35 per cent. Such figures illustrate in a very clear way how uncertain is the effect of the fertilizers, and how much has still to be discovered before the element of chance is greatly reduced or entirely removed.

Marrow-stem kale is a crop that has increased considerably in favour in recent years, particularly with dairy farmers. Recent experiments have shown that it gives a big response to nitrogen—a response that is maintained for very heavy dressings. The following results from Jealott's Hill are sufficiently striking:—

<i>Year.</i>	<i>Tons per acre of Green Crop</i>			
	<i>No Nitro-Chalk</i>	<i>3 cwt. N.C. per acre.</i>	<i>6 cwt N.C. per acre.</i>	<i>9 cwt. N.C. per acre.</i>
1930	11.16	12.82	16.22	18.15
1931	12.82	17.56	22.64	24.80
1932	15.66	18.55	25.25	27.80
Av. 3 years	13.21	16.31	21.37	23.58

Severe thinning is detrimental to the weight of crop and only a moderate amount of cultivation is necessary.

Summary.—As this is the concluding note of a series of eight articles on the subject of manuring by the present writers, it may not be inappropriate to summarize certain of the more important points that have been discussed.

Attention was first drawn to the extraordinary variation in the extent to which practical men make use of artificial fertilizers. Broadly speaking, the main regulating factor appears to be the selling value of the crop. Thus, for most farm crops, artificials are used at rates ranging from nil to a few cwt. per acre, whereas, with market garden and glass-house crops, quantities are measured in terms of tons per acre. If wheat or mangolds had ten times their present value, the farmer would doubtless quickly imitate the nurseryman. In this very broad sense, the question is one of economics, but closer examination makes it difficult to establish a very definite connexion between heavy expendi-

NOTES ON MANURING

ture on artificials and high profits; this is probably due to the great weight of the other factors in successful farming. For this reason, it was thought necessary to emphasize the importance of drainage, cultivations, liming, etc., as well as, and indeed before, manuring.

With prices remaining at about their present level, it is clear that, for any appreciable advance to be made in the use of fertilizers, at least two things are necessary—to obtain further evidence of their economic value on the many different soils and under the greatly varying conditions to be found in this country, and also to evolve effective means of convincing the farmer that expenditure in this direction will give at least a reasonable return.

Anyone who breaks away from the generalizations to be found in text books, and honestly looks for detailed evidence applicable to, say, the soils of a particular county, will be forced to admit that, even for the most important crops, the information is extremely meagre. Indeed, it would not be too much to say that three-quarters of the recommendations commonly made for the manuring of farm crops are based on the results of the "classical" fields at Rothamsted, while for most garden crops the receipts are based either on traditional practice or on nothing better than botanical relationship.

Since the location of the few experimental stations in this country has been largely fortuitous (like Rothamsted itself) and certainly not determined by the type of soil, the required evidence cannot be obtained by trials at these stations alone, and more and more accurate experiments should be conducted in every county. For rapid progress to be made, these should be co-ordinated on a provincial or wider basis, and should employ the greatly improved experimental methods (insensitive though these still remain) developed in recent years. As yields creep up to higher and higher levels, any further advance becomes more and more difficult, and also more and more difficult to prove. With some crops, however, 10 or even 5 per cent. increases are of importance, and the methods necessary to measure them must be devised.

The following extract from a paper, by George Dunlop, in the *Journal of Agricultural Science*, October, 1933, on "Methods of Experimentation in Animal Nutrition" is equally applicable to crop nutrition:—

"The progress of scientific study and experiment during the present century, and more particularly during the past decade, has

NOTES ON MANURING

done much to add to our knowledge. This rapid advance has been due to the invention of accurate and rapid methods which research workers have quickly adopted in investigations of allied problems. Those sciences which have developed most rapidly in recent years have been characterized by the improved and apparently infallible nature of their technique; atomic physics and biochemistry may be cited as examples. While our present state of knowledge of the subject of nutrition would have been extremely difficult to realize a few years ago, the growth of its applied branches, and especially that branch which concerns itself with the nutrition of farm animals, must only be described as disappointing. It is true that results of value have accumulated in the study of mineral requirements, but our conception of these still remains on a qualitative basis. Our knowledge of the maximum amounts of the essential dietary nutrients for each species of animal has remained vague and at present would seem to have little prospect of becoming more precise. Lack of sufficiently accurate experimental methods appears to be the chief obstacle to a rapid and accelerating growth of the subject. It would appear therefore that an improvement in technique is the first essential to a concise and more complete aspect of the proper nutrition of farm animals."

Without waiting for the new knowledge obtained by improved experimental methods, there is already much that still needs demonstration, however well acquainted with it the more progressive growers may be. For this, the older scheme of single or duplicate plots may be quite sufficient, especially if the demonstration areas are carefully chosen. Anyone who has visited such centres as Saxmundham or Tunstall in East Suffolk will at once appreciate their great educational possibilities, and many must have wished for similar permanent plots in their own county.

Another channel for spreading fundamental information on plant nutrition, which has not yet been fully utilized, is the rural school. By means of eight plot tests, and other demonstrations in school gardens, it should be possible to eliminate completely the last vestiges of prejudice that still linger in the minds of rural workers regarding the value and use of artificial manures.

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc.(Agr.),
Principal, Moulton Farm Institute, Northampton.

Fish Meal in Pig Rations.—In a recent note on feeding, the writer mentioned that, in the Ministry's Advisory Leaflet on Pig Feeding,* meat meal and blood meal had been recommended for inclusion in rations, in preference to fish meal, mainly because complaints had been made from time to time that fish meal had tainted the pig's carcass and so affected the quality of the product. It should be recognized, however, that complaints have invariably arisen on account of lack of care in the use of fish meal. In this connexion, it should be noted that it is essential, in the first instance, that care should be exercised in the selection of the brand or grade of fish meal; for feeding purposes the fish meal should be covered by a guarantee that it is made from sound white fish, and also that the oil does not exceed the prescribed limit. In practice, the proportion included in a ration should not exceed 10 per cent. at any time. As regards the bacon pig, after it has reached 14 to 16 weeks old, the fish meal may be restricted to 5 per cent. and supplemented with some other protein rich food, as, for example, soya bean meal (ext.). For safety's sake, the fish meal should be omitted altogether in the last 3 weeks before slaughter. Provided that these simple and quite reasonable precautions are observed, no trouble should arise through fish meal tainting the carcass.

An American investigator, De Lisle, claims that, in general, the proportions of essential amino acids found in fish proteins are approximately the same as in milk. In the past, before milk-selling was developed to the present extent on English farms, the usual rations fed to pigs consisted of skim milk, sharps and barley meal. Those ingredients, together with green stuff or fresh roots in season, constituted a balanced ration; but when the farmer sold his milk whole, and gave up butter making, a vital portion of the pig's ration disappeared. In many instances, feeding was continued with the sharps and barley

* Advisory Leaflet No. 104.

NOTES ON FEEDING

alone without skim milk, and often without any other protein supplement except, perhaps, beans. In such circumstances, the pigs ceased to have a balanced ration.

Numerous protein rich foods are now upon the market, from which the bacon producer can choose, but he would be well advised to adhere to some form of animal protein, at least to the extent of 5 per cent. of the ration, unless he has some separated milk or large supplies of whey available on the farm.

In experiments recently carried out on the Continent, fish meal, irradiated and non-irradiated yeast were compared as supplements to a cereal (barley meal) ration. In food value, fish meal and irradiated yeast proved equal, with non-irradiated yeast 10 per cent. less effective. Feed costs per kg. gain were lowest with fish meal. The last-named food is now at a considerably lower price per ton than ordinary dried yeast, while, so far, irradiated yeast is not on the British market. Although the yeast produced rather better quality carcasses than fish meal, commercial pig feeders are likely to continue to use fish meal in preference to yeast on account of the lower costs and generally satisfactory results from its use.

Feeding Separated Milk.—The low price of milk, and the existence of a surplus much above the capacity of the liquid milk market, should result in the greater use of milk and milk products for stock feeding. The use of whole milk for calf-rearing requires no comment, but, in view of the increasing importance of the bacon-pig industry, a note on the value of separated milk for pig-feeding may not be inopportune. One of the advantages, in regard to pig production, which Denmark possesses, compared with this country, is that the majority of pig-raisers there can obtain supplies of separated milk or whey without difficulty.

Considerable attention has been paid to the question of how to utilize separated milk to the best advantage. American and other figures show that separated milk has the higher meal equivalent when it is not used too liberally in proportion to meal. When the separated milk has been restricted to a proportion of from 1 to 3 lb. of milk to each 1 lb. of meal, it has required only 3 to 4 lb., or about $\frac{1}{3}$ gal. of separated milk to replace 1 lb. of meal; whereas, when the proportion has been from $\frac{1}{3}$ gal. to $\frac{3}{4}$ gal. of milk to 1 lb. of meal, it has required fully $\frac{1}{2}$ gal. of separated milk to replace 1 lb. of meal. To get the best results in food value, there-

NOTES ON FEEDING

fore, separated milk should be restricted to about $\frac{1}{2}$ gal. fed with 1 lb. of meal. In other words, it is economical to spread the use of separated milk over as many pigs as possible, in preference to giving unlimited quantities to any particular lot. Sows in milk, young pigs, and those just after weaning, give a better response to the use of separated milk than baconers in the later stages of fattening. Separated milk is relatively rich in protein and may dispense with the need to use fish meal. Even where only a limited quantity of separated milk is available, a small amount, along with soya bean meal to provide the remainder of the protein, will give quite as satisfactory results as fish meal. Separated milk should be worth about $1\frac{1}{2}d.$ to $2d.$ per gal. on the farm for feeding purposes.

Feeding Whey.—Whey differs in composition from separated milk in being low in protein. It is commonly stated that it requires fully 1 gal. or 12 lb. of whey to replace 1 lb. of barley meal or other carbohydrate-rich food of similar composition, but, as with separated milk, if the proportion of whey to meal is restricted, the whey has a higher meal equivalent. Best results in this respect will be obtained where the amount of whey is fed at the rate of about 3 lb. or $\frac{1}{2}$ gal. along with each 1 lb. of meal. On large cheese-making farms, however, whey is usually abundant and, from the cheese-maker's point of view, the pig is of chief importance as a whey drinker; the more that the pig can drink, the more satisfied is the cheese-maker. Where very large quantities are given, however, the rate of growth is likely to be slow; and, in order to guard against thin bellies and thick, back fat, the whey should be balanced by using a suitable protein-rich food such as soya bean meal (ext.). Decorticated ground-nut meal, unless very low in oil content, is less satisfactory as regards quality of carcass. If these protein-rich foods are included at the rate of 10 per cent. to $12\frac{1}{2}$ per cent. of the meal portion of the ration, satisfactory results should be obtained. It is advisable to use a mineral supplement at the rate of say, 1 to 2 lb. in each 1 cwt. of the meal mixture.

Whey should be worth about $\frac{1}{2}d.$ per gal. on the farm for feeding to pigs.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British	£ 4 10	£ 0 8	£ 4 2	72	s. 1 2	d. 0-62	% 9-6
Barley, British feeding	5 15	0 8	5 7	71	1 6	0-80	6-2
" Argentine	4 12*	0 8	4 4	71	1 2	0-62	6-2
" Danubian	4 13	0 8	4 5	71	1 2	0-62	6-2
" Persian	4 12*	0 8	4 4	71	1 2	0-62	6-2
" Russian	4 15	0 8	4 7	71	1 3	0-67	6-2
Oats, English white	6 10	0 9	6 1	60	2 0	1-07	7-6
" " black and grey	6 10	0 9	6 1	60	2 0	1-07	7-6
" Canadian No. 2 Western	6 18	0 9	6 9	60	2 2	1-16	7-6
" " mixed feed	5 8	0 9	4 19	60	1 8	0-89	7-6
" Argentine	6 8	0 9	5 19	60	2 0	1-07	7-6
" Chilean	6 8	0 9	5 19	60	2 0	1-07	7-6
" Russian	6 10	0 9	6 1	60	2 0	1-07	7-6
Maize, Argentine	5 5	0 7	4 18	78	1 3	0-67	7-6
" Gal. Fox	5 0†	0 7	4 13	78	1 2	0-62	7-6
" Russian	4 18†	0 7	4 11	78	1 2	0-62	7-6
Beans, English Winter	5 15‡	0 16	4 19	66	1 6	0-80	10-7
Peas, Japanese	19 10†	0 14	18 16	69	5 5	2-90	18-1
Dari	7 5†	0 8	6 17	74	1 10	0-98	7-2
Milling offals—Bran, British	5 5	0 15	4 10	43	2 1	1-12	9-9
" " broad	6 2	0 15	5 7	43	2 6	1-34	10
Middlings, fine imported	5 0	0 12	4 8	69	1 3	0-67	12-1
Weatings†	5 2	0 13	4 9	56	1 7	0-85	10-7
" Superfine†	6 2	0 12	5 10	69	1 7	0-85	12-1
Pollards, imported	4 12	0 14	3 18	62	1 3	0-67	11
Meal, barley	6 5	0 8	5 17	71	1 8	0-89	6-2
" " grade II	5 10	0 8	5 2	71	1 5	0-76	6-2
" maize	6 2	0 7	5 15	78	1 6	0-80	7-6
" " germ	6 2	0 11	5 11	79	1 5	0-76	8-5
" locust bean	7 0	0 5	6 15	71	1 11	1-03	3-6
" bean	7 15	0 16	6 19	66	2 1	1-12	19-7
" fish	16 0	2 1	13 19	59	4 9	2-54	53
Maize, cooked flaked	6 7	0 7	6 0	84	1 5	0-76	9-2
" gluten feed	5 17	0 12	5 5	76	1 5	0-76	19-2
Linseed cake, English, 12% oil	9 5	1 0	8 5	74	2 3	1-21	24-6
" " " 9% "	8 17	1 0	7 17	74	2 1	1-12	24-6
" " " 8% "	8 12	1 0	7 12	74	2 1	1-12	24-6
" " " 6% "	8 17‡	1 0	7 17	74	2 1	1-12	24-6
Soya-bean cake, 54% oil	7 0‡	1 8	5 12	69	1 7	0-85	35-9
Cottonseed cake—English, Egyp- tian seed, 44% oil	4 10	0 17	3 13	42	1 9	0-94	17-3
" " Egyptian, 44% "	4 0	0 17	3 3	42	1 6	0-80	17-3
" " decorticated, 7% "	6 12†	1 8	5 4	68	1 6	0-80	34-7
" meal, decorticated, 7% "	6 10†	1 8	5 2	68	1 6	0-80	34-7
Coconut cake, 6% oil	6 0	0 18	5 2	77	1 4	0-71	16-4
Ground-nut cake, 6-7% oil	5 15*	0 18	4 17	57	1 8	0-89	27-3
" " decor., 6-7% oil	6 15	1 7	5 8	73	1 6	0-80	41-3
" " " imported, ...	5 15	1 7	4 8	73	1 2	0-62	41-3
" " decorticated, 6-7% oil	5 17‡	0 12	5 5	73	1 5	0-76	16-9
Palm-kernel cake, 44-54% oil	5 17‡	0 12	5 5	73	1 5	0-76	16-9
" " " meal, 44% oil	5 5	0 12	4 13	71	1 4	0-71	16-5
" " " meal, 1-2% oil	5 0	0 8	4 12	51	1 10	0-98	2-7
Feeding treacle	4 15	0 11	4 4	48	1 9	0-94	12-5
Brewers' grains, dried ale	4 5	0 11	3 14	48	1 6	0-80	12-5
" " " porter	5 5	0 5	5 0	66	1 6	0-80	5-2

(a) Carriage paid in 5 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

† In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of March, 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 12s. 5d. Dividing this again by 27.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1s. 9d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 7s. 6d.; P₂O₅, 2s. 1d.; K₂O, 3s. 8d.

FARM VALUES OF FEEDING STUFFS

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	4 13
Maize	78	7.6	5 1
Decorticated ground-nut cake	73	41.3	6 15
„ cotton cake ..	68	34.7	6 12

(Add ros. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.31 shillings, and per unit protein equivalent, 1.34 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1933, issue of the Ministry's JOURNAL, p. 784.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	5 7
Oats	60	7.6	4 9
Barley	71	6.2	5 1
Potatoes	18	0.8	1 5
Swedes	7	0.7	0 10
Mangolds	7	0.4	0 10
Beans	66	19.7	5 13
Good meadow hay	37	4.6	2 15
Good oat straw	20	0.9	1 7
Good clover hay	38	7.0	2 19
Vetch and oat silage	13	1.6	0 19
Barley straw	23	0.7	1 11
Wheat straw	13	0.1	0 17
Bean straw	23	1.7	1 12

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d. net.

MISCELLANEOUS NOTES

Course of Instruction in Pig Management

IN view of the success of the short course in pig management, which was held last year at the Staffordshire Farm Institute at Rodbaston, a similar course was held again this year from March 20-23. Twenty-four students attended and resided in the Institute for the period of the course. They were mainly sons of farmers from the county area, although others came from Lancashire, Berkshire, Oxfordshire and Dorsetshire. A few of the young men attending had been sent to the course by their employers in order that they could obtain up-to-date practical instruction. The mornings were devoted to lectures on breeding, feeding, general management, housing and diseases. Practical demonstrations were given in the afternoons at the Institute piggeries to illustrate the importance of the judging of live animals and carcasses for commercial requirements. Visits were paid during the course to Messrs. Marsh and Baxter's factory, at Brierley Hill, and to the Harper Adams Agricultural College, where various pig-feeding experiments are being conducted. The students were also able to gain much information of practical importance by informal discussions with members of the staff during the short period of residence at the Institute.

The Agricultural Index Number

AT 108, the general index number of agricultural produce for March was 4 points lower than a month earlier but was 6 points above the figure recorded for March, 1933. The lower prices realized for milk were chiefly responsible for the drop of 4 points as compared with February; reductions also occurred in the quotations for fat cattle, pork pigs, eggs and potatoes but these were mostly offset by increases in fat sheep and hay.

Grain.—The average for wheat fell by 1*d.* to 4*s.* 4*d.* per cwt. and the index by 2 points to 58. If, however, allowance is made for the "deficiency payments" under the Wheat Act, 1932, the index would be raised to 135 and this would have the effect of raising the general index from 108 to 113. A decline of 5*d.* to 8*s.* 9*d.* per cwt. in the quotation for barley was more pronounced than in 1911-13

MISCELLANEOUS NOTES

Monthly index number of prices of Agricultural Produce.
(Corresponding months of 1911-13 = 100.)

<i>Month.</i>	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	108
April	146	137	123	117	105	—
May	144	134	122	115	102	—
June	140	131	123	111	100	—
July	141	134	121	106	101	—
August	152	135	121	105	105	—
September	152	142	120	104	107	—
October	142	129	113	100	107	—
November	144	129	112	101	109	—
December	143	126	117	103	110	—

and the index was 2 points lower at 111, while oats, at 6s. 2d. per cwt., were 3d. cheaper and fell 4 points to 87. A year ago the indices for wheat, barley and oats were 69, 79 and 84 respectively.

Live Stock.—Fat cattle continued to sell at rather lower prices during March, the average for second quality being about 1s. per live cwt. below that for February, and the index was 4 points lower at 99. A sharp rise of $\frac{3}{4}$ d. per lb., however, occurred in the quotation for fat sheep, the index for which advanced by 6 points to 118. Bacon pigs also recorded a slight increase but as this was proportionately smaller than that which occurred in the base period, the index fell from 129 to 127. The index for pork pigs also was lower, a drop of 4 points to 131 being occasioned by a reduction of 5d. in the average price to 13s. 10d. per score lb. Both store cattle and dairy cows were cheaper on the month, the former by about 7s. and the latter by 13s. per head, but whereas the index for store cattle fell by 6 points, that for dairy cows was unaltered. The customary advance was noticeable in the price of store sheep which again averaged 9 per cent. less than in the pre-war period. Quotations for store pigs, however, were reduced, the average fall being about 1s. 6d. per head, and as a rise occurred in the base period, the index declined by as much as 16 points.

Dairy and Poultry Produce.—The contract prices for milk were 14d. per gallon in all regions during March as compared with 16d. in February and the index was 20 points lower at 141. Cheese was slightly dearer and the index rose one point to 116; butter, however, showed a further fall of $\frac{1}{2}$ d. per lb., the index being 84 as compared

MISCELLANEOUS NOTES

with 86 a month earlier. The seasonal decline in the prices of eggs which was apparent throughout the greater part of the month, continued more severe than in the pre-war period, and averaged 4*d.* per dozen, the index falling 6 points to 89. Both fowls and ducks were rather dearer during March and the combined index for poultry at 126 was 8 points above a month earlier.

Other Commodities.—A slight drop of 1*s.* per ton was recorded in the average price of potatoes but the index was reduced 3 points to 97 owing to the fact that prices rose between February and March, 1911-13. Clover hay appreciated slightly in value while meadow hay remained firm in price, and the combined index for hay was 2 points higher at 81. Except for onions, which again cheapened, vegetables continued to sell at exceptionally high prices, the index being 206. There was a small reduction in the average for wool and the index was 2 points lower at 98.

MONTHLY INDEX NUMBERS OF PRICES OF INDIVIDUAL COMMODITIES. (CORRESPONDING MONTHS OF 1911-13=100.)

Commodity	1932	1933		1934		
	Mar.	Mar.	Dec.	Jan.	Feb.	Mar.
Wheat	81	69	61	59	60	58
Barley	104	79	111	117	113	111
Oats	105	84	75	80	91	87
Fat cattle... ..	121	105	97	106	103	99
„ sheep... ..	100	112	106	117	112	118
Bacon pigs	97	110	109	125	129	127
Pork „	109	118	126	136	135	131
Dairy cows	120	109	106	105	101	101
Store cattle	121	103	85	90	92	86
„ sheep	91	85	86	93	91	91
„ pigs	105	122	147	163	159	143
Eggs	104	101	99	97	95	89
Poultry	123	129	110	115	118	126
Milk	117	129	166	166	161	141
Butter	107	93	97	92	86	84
Cheese	138	110	106	114	115	116
Potatoes	264	106	112	104	100	97
Hay	70	66	80	79	79	81
Wool	76	62	84	95	100	98

Revised index numbers due to Wheat Act payments.

Wheat	—	132	136	136	135	135
General Index	—	106	115	119	117	113

MISCELLANEOUS NOTES

Western Commercial Show, Penzance, 1934

THE Western Commercial Spring Show (held this year on March 15-16 at Penzance) is an important annual event for all flower and broccoli growers, especially those in the West of England. Amongst visitors to the show are growers, merchants and salesmen from all parts of England. The flowers and vegetables shown are produced on the farms of commercial growers in Devon and Cornwall, and are typical of the produce normally sent from the West to distant markets.

Competition entries form the largest proportion of the exhibits, and emphasis is laid on the presentation of these as packed for market. The flowers formed the most striking display, and of these trumpet daffodils, for which the Penzance area is famed, were particularly numerous. There were many exhibits of flowers as bunched for market and also of flowers packed in wooden boxes; of the latter, one superbly presented box of King Alfred daffodils, exhibited by Messrs. Tomlin Bros. (Polgoon, Penzance), won the Challenge Cup presented by H.R.H. the Prince of Wales for the best practical market garden exhibit in the flower classes. In addition to daffodils and narcissi there was a strong entry of violets and anemones; a marked improvement in the quality of these flowers is noticeable since the growers have made a determined effort to replace French flowers by English-grown flowers of equal or better quality.

During the show competitions were also held for skill in preparing and packing flowers and broccoli for market. Narcissi and violets were bunched and tied, the appearance of the bunch and time taken both being considered in awarding the prize.

There was a very large entry of trimmed broccoli packed in market crates. The broccoli was of the Roscoff type, for which Cornwall is now celebrated. Here again the high standard of quality and packing had never been surpassed. In addition to broccoli packed for market, a "plantation" competition was held for Roscoff broccoli growing in the fields, and the judges reported that the strains have considerably improved and that cultivation was of a very high standard.

AGRICULTURAL WAGES (REGULATION) ACT, 1924

Illegal to Contract out of the Benefits and Advantages Order

On April 11, a Divisional Court, consisting of the Lord Chief Justice, Mr. Justice Avory and Mr. Justice Humphreys, heard the Ministry's appeal against the decision of the Brigg (Lincolnshire) magistrates in a case which was brought before them on November 7 last.

The employer had been charged with failing to pay wages at not less than the minimum rates fixed under the Agricultural Wages (Regulation) Act, as although the worker had received the statutory weekly minimum wage in full in cash, he had handed back 20s. to his employer's wife or daughter in respect of the provision of board and lodging. The Justices found that the employer paid the worker in cash the full amount of the wages to which he was entitled under the Order; they also found that at the time of the worker's engagement the employer told the worker that he could lodge where he liked, but that if he lodged with him he would have to pay £1 per week. The Kesteven and Lindsey Agricultural Wages Committee had defined board and lodging as a benefit or advantage which might be reckoned in the case of a male worker aged 18 and over at not more than 15s. per week, which sum could be reckoned as payment of wages in lieu of payment in cash. The Justices found that as the worker had in the first instance received the minimum wage in full in cash, no contravention of the Act had occurred. The Ministry considered that as the worker had paid more for board and lodging than the amount specified by the Agricultural Wages Committee, the magistrates' determinations were not correct in point of law and brought the matter before a Divisional Court.

The Ministry's appeal was upheld and a transcript of the judgment follows.

THE LORD CHIEF JUSTICE: In my opinion this appeal ought to be allowed.

I agree, if I may say so, entirely with the argument which has been made by the learned Attorney-General, attractive as Mr. Monckton's argument is upon a first view. No doubt it does seem hard that a man shall not be allowed to spend his wages as he pleases, but when one looks at this Act and the purpose of this Act I cannot help thinking that

AGRICULTURAL WAGES

within certain limits the very purpose of the Act is to prevent what has been called an independent bargain. Section 7, sub-section (10) provides as follows:—"Any agreement for the payment of wages in contravention of this Act, or for abstaining to exercise any right of enforcing the payment of wages in accordance with this Act, shall be void," and when one comes to Section 8, which is to be read in close connexion with sub-section (11) of the preceding section, it is provided that the Minister shall have power "to make regulations for the following purposes: (a) for requiring"—the word requiring is important—"the wages committees by order to define"—now to define what? Not only "the benefits or advantages which may be reckoned as payment of wages in lieu of payment in cash," but also, "the value at which they are to be reckoned," and that being so it seems to me to be quite immaterial that in a particular case the employed person is willing to pay more. The Act says that the wages committees may be required by order to define the value at which certain things are to be reckoned, they are only certain things, and when one looks at the Order which has been made they are what one would naturally expect: milk, potatoes, oil and fuel, board and lodgings, and in the case of a man or a youth of the age of the waggoner here, the board and lodging are defined to be of the value of 15s. per week of seven days, and however hard it may seem in the particular case, I cannot help thinking that this part of the Act would be reduced to a nullity if notwithstanding the clear words of this section, what is called an independent or a collateral bargain could be made between the employer and the employed whereby the value defined by the wages committee was exceeded. At first blush the suggestion that what was done here was done voluntarily is attractive, but if that argument was to prevail it seems to me to follow, as indeed Mr. Monckton in one passage of his ingenious argument appeared to admit, the only utility of the definition provided for in section 8 (1) (a) would be limited to a case where payment was made against an unwilling person. When I look at the form of this transaction and compare it with what seems to be the reality, I think the truth of the matter on the facts found in this case is clearly this, that this man had no alternative but to pay 20s. a week for that which was defined in value as being worth 15s. a week, and I think that one only gets into confusion by travelling

AGRICULTURAL WAGES

beyond the matters of which the value is defined by the Committee into matters over which the Committee has no control whatever. It is nothing to the purpose to say that a man may pay what he likes for his boots or his clothes. Where there is a definition of the value made by the Committee it appears to me that the Statute says that amount is not to be exceeded. Speaking for myself I think it is mere matter of form that the one bargain: I will employ you at 31s. a week, is said to be separate from and independent of the other bargain: If you come to lodge in my house you shall pay me £1 a week. I think that the effect of this enactment is that the farmer is bound to say: I cannot prevent you from paying £1 a week to somebody else, but as between you and me or as between employer and employed since the passing of this Act I am limited to 15s. as are you. I think, therefore, that if effect is to be given to this Statute that which was done here, although no doubt done in perfect good faith, was a contravention of the provisions of the Statute and that this appeal ought to be allowed and that the case ought to go back to the Justices with a direction that the offence which was charged was proved.

MR. JUSTICE AVORY: I agree. However attractive at first sight the argument of Mr. Monckton is that an agricultural worker who has once been paid the wages fixed under this regulation ought to be allowed to spend his money as he pleases, I have come to the conclusion that the effect of particularly sub-sections (10) and (11) of Section 7 and the provisions of Section 8 of the Act of 1924 in effect does prohibit the agricultural worker from spending more than a certain amount upon certain matters which are described as benefits or advantages under the Act, one of those or two of those benefits or advantages being board and lodging, and that the effect of the legislation and of the regulations and definitions of the wages committee is that in this case the worker was not permitted to make an agreement for payment of more than 15s. a week for his board and lodging as between him and his employer. I entirely agree with what my lord has said that there is nothing in the Act to prevent him when he has once been paid his full wages and in the absence of an agreement with his employer from going into a village and paying what he pleases for anything which is not provided for by these regulations as between the employer and worker.

AGRICULTURAL WAGES

I agree, therefore, that this case should be remitted to the magistrates to find that the employer is liable.

MR. JUSTICE HUMPHREYS: I agree. I have felt great difficulty in the course of the argument in this case, but on the whole I have arrived at the same conclusion as the other members of the Court. I think the Attorney-General was right in saying that if the Court once allowed the theory of an independent contract to be established, the Court would have to put itself in the position which the legislature by Section 8 sub-section (1) of this Act has reserved for the wages committee, of deciding not only what benefits or advantages may be reckoned as payment of wages in lieu of payment in cash, but also the value at which they are to be reckoned, in other words, that the Court would be doing in the case of benefits or advantages which are defined under the Act that which the Court is required to do in the case of benefits or advantages which are not defined under the Act; I am referring to sub-section (11) of Section 7 of the Act under which the Court itself decides what is the value of the benefit or advantage which accrued to the employee in the particular case.

I agree with the judgments which have been pronounced.

MR. HUBERT HULL: The appeal will be allowed with costs, the case to go back to the magistrates with a direction to convict and to order the payment of the arrears, the amount of which is found in the case?

THE LORD CHIEF JUSTICE: Yes.

Farm Workers' Minimum Rates of Wages. A meeting of the Agricultural Wages Board was held at 7, Whitehall Place, London, S.W.1, on April 17, 1934, the Rt. Hon. The Viscount Uxswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum rates of wages and proceeded to make the following Orders:—

Buckinghamshire.—An Order cancelling as from April 29, 1934, the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on that date. The minimum rates for male workers of 21 years of age and over are 31s. per week of 50 hours (instead of 51 as at present) in summer, except in the weeks in which Easter Monday and Whit Monday fall when the hours are 41 (instead of 51 as at present) and 48 (as at present) in any week in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 31 (instead of 48 as at present), with overtime at 9d. per hour (instead of 8½d. as at present) on weekdays and 11d. per hour for all employment on Sundays, Easter Monday, Whit Monday, Christmas Day and Boxing Day (instead of 10d. per hour as at present for employment on Sundays and in excess of 5½ hours or after 1 p.m. on Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day). The minimum rate for female workers of 18 years of age and over is

AGRICULTURAL WAGES

unchanged at 6d. per hour, with overtime at 7½d. per hour instead of 7d. as at present) on weekdays and 9d. per hour for all employment on Sundays, Easter Monday, Whit Monday, Christmas Day and Boxing Day (instead of 8d. per hour as at present for employment on Sundays and in excess of 5½ hours or after 1 p.m. on Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day).

Hampshire and Isle of Wight.—An Order cancelling as from April 29, 1934, the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on that date. The minimum rates for male workers of 21 years of age and over are 30s. 6d. (instead of 29s. 6d. as at present) per week of 53½ hours in summer and 48 hours in winter, except in the week in which Christmas Day falls, when the hours are 40½, with overtime throughout the year unchanged at 8d. per hour, except in the case of carters, cowmen, shepherds and milkers, for work in connexion with the immediate care of animals, in which case the overtime rate is 7½d. per hour. The minimum rate for female workers of 18 years of age and over is unchanged at 5d. per hour for all time worked.

Leicester and Rutland.—An Order cancelling as from April 29, 1934, the existing minimum and overtime rates of wages and fixing fresh rates in substitution thereof to come into force on that date. The minimum rates of wages for male workers of 21 years of age and over are 33s. (instead of 32s. as at present) in Leicestershire and 31s. 6d. (instead of 30s. 6d. as at present) in Rutland, per week of 54 hours throughout the year (instead of 56½ hours in summer and 54 hours in winter as at present), the overtime rates being unchanged in both counties at 9d. per hour on weekdays and 11d. per hour on Sundays. The minimum rate of wages for female workers of 18 years of age and over remains unchanged at 5d. per hour with overtime at the rate of 8d. per hour for Sunday work.

Lincs. (Holland).—An Order cancelling as from May 1, 1934, the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on that date. The minimum rates for male workers of 21 years of age and over are 33s. (instead of 32s. 6d. as at present) per week of 50 hours. In the case of horsemen, cattlemen and shepherds of similar age, inclusive weekly sums are fixed to cover all time worked in excess of the number of hours mentioned above, except employment which is to be treated as overtime employment. The overtime rates in the case of male workers of 21 years of age and over are 10½d. per hour on Saturdays (or on any other day agreed as the weekly short day), 1s. 1½d. per hour on Sundays and 9d. per hour for all other overtime employment. The minimum rate for female workers of 15 years of age and over is 6d. per hour for all time worked.

Oxfordshire.—An Order fixing minimum and overtime rates of wages to come into force on May 6, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until March 3, 1935. The minimum rates for male workers of 21 years of age and over are 30s. (instead of 29s. as at present) per week of 50 hours in summer, except in the weeks in which Whit Monday and August Bank Holiday fall when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 31, with overtime throughout the period at 9d. per hour on weekdays and 11d. per hour on Sundays, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day (instead of 8½d. and 10½d. per hour respectively as at present). The minimum rate for female workers of 18 years of age and over is unchanged at 6d. per hour, with overtime as at present at 7½d. per hour on

AGRICULTURAL WAGES

weekdays and 9d. per hour on Sundays, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day.

Yorks. (West Riding).—An Order continuing the operation of the existing minimum and overtime rates of wages from May 24, 1934 (i.e., the day following that on which the existing rates are due to expire) until further notice. The minimum rates for male workers living-in range from 29s. 11d. per week, or £77 15s. 8d. per annum, for foremen, to 20s. 5d. per week, or £53 1s. 8d. per annum for workers in their first and second years of employment. These sums, which include the value of board and lodging as defined by the Committee, are in respect of a week of 48 hours in winter and 52½ hours in summer, with in addition not more than 12 hours per week on weekdays and 3 hours on Sundays to cover work in connexion with the care and attention to stock. For waggoners and other horsemen, beastmen and shepherds not living-in, the minimum rates for the same number of hours are 38s. 6d. per week for workers of 21 years of age and over. For other male workers of 21 years of age and over the minimum rate is 32s. 9d. per week of 48 hours in winter and 52½ hours in summer.. The overtime rates for male workers of 18 years of age and over are 10½d. per hour on weekdays and 1s. 0½d. per hour on Sundays. For female workers the minimum rates for workers of 18 years of age and over are 4½d. per hour for a week of 44 hours, with overtime at 5½d. per hour.

Merioneth and Montgomery.—An Order continuing the operation of the existing minimum and overtime rates from May 1, 1934 (i.e., the day following that on which the existing rates are due to expire) until April 30, 1935. The minimum rates are for male workers of 21 years of age and over, employed wholly or mainly as stockmen, teamsters, carters or shepherds, 31s. per week of 60 hours, and for other male workers of 21 years of age or over, 27s. for a week of 54 hours, with overtime in each case at 9d. per hour. For female workers of 18 years of age and over the minimum rate is 5d. an hour for all time worked.

Enforcement of Minimum Rates of Wages.— During the month ending April 14, legal proceedings were taken against seven employers for failure to pay the minimum rates of wages fixed by the orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.	Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
		£ s. d.	£ s. d.	£ s. d.	
Cumberland and Westmorland	Carlisle	*	—	—	1
Hereford	Bromyard	10 0 0	—	24 0 0	1
"	"	*	—	—	1
"	Leominster	1 0 0	—	14 14 6	2
"	"	10 0	10 0	3 5 0	3
Yorks, W.R.	Doncaster	—	1 5 0	24 0 0	2
Pembroke and Cardigan	Aberayron	1 0 0	10 0	18 0 0	1
		£12 10 0	£2 5 0	£83 19 6	11

* Case dismissed.

NOTICES OF BOOKS

APPOINTMENTS

County Agricultural Education Staffs

ENGLAND

Hampshire.—Mr. J. J. O'Carroll has been appointed Assistant Instructor in Horticulture and School Gardens Officer, *vice* Mr. W. C. Ibbett, N.D.H.

Somersetshire.—Mr. W. J. England, N.D.A., N.D.D., has been appointed Vice-Principal of the County Farm Institute, *vice* Mr. G. G. Gregory, B.Sc. (Agric.), N.D.A.

Cornwall.—Miss E. M. Laity, N.D.D., has been appointed Temporary Assistant Instructor in Dairying.

NOTICES OF BOOKS

Modern Bee-Keeping. By H. Mace, F.E.S. Revised ed. Pp. xx + 225, and 129 Figs. (Harrow, Essex: "Bee-Keeping Annual" Office. 1933. Price 5s.)

Every aspect of modern bee-keeping practice is dealt with in this brochure, which has already passed through four editions, and now appears in a revised and enlarged form. The discovery of a cure for Acarine disease and the expansion of the Association movement have necessitated important alterations in two sections of the text. There are numerous illustrations, a page of recipes and other useful information, and a supplement containing a complete list of bee-keeping organizations throughout the British Isles.

Watermills and Windmills: An Historical Survey of their Rise, Decline and Fall as Portrayed by those of Kent. By W. Coles Finch, M.Inst.C.E. Pp. 336. 330 Figs. and 8 Maps. (London: The C. W. Daniel Co. 1933. Price 15s.)

This addition to the literature of watermills and windmills will make a strong appeal to readers who are interested in rural life and industry. The author has devoted some attention to the subject in previous volumes, and the interest thus aroused appeared to warrant this special survey of mills in general, and of Kentish mills in particular. Commencing with the watermills recorded in the Domesday Book, he traces their supersession by windmills, and then the gradual abandonment of the latter till the present day, when their entire disappearance seems imminent. He relates very pleasantly the life-stories of four hundred and ten mills, of which there remain but seventeen in action and fifty-two derelicts. The numerous illustrations include some reproduced from rare photographs and prints, and the text is full of curious information.

The Milk Trade: A Comprehensive Guide to the Development of the Dairy Industry. Edited by C. Raison. Introd. by J. F. Blackshaw. 2 vols. Pp. xxii + 513. (London: Virtue & Co. Ltd. 1933. Price 36s.)

This comprehensive survey covers all phases of the dairy industry, and the author has taken considerable pains to co-ordinate in these volumes a great deal of material which will be of use and interest both to the trade and to the dairy farmer. Interesting reading is to be found in the several chapters devoted to the growth of the dairy industry, while suggestions as to its possible future development are also included. Much useful information is given in the chapters dealing with the treatment of milk, the laws relating to milk, the chemical composition of milk and methods of testing, etc. The manufacture of dairy produce, i.e., butter, cheese, icecream, and condensed milk, is also discussed.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 3 June, 1934

NOTES FOR THE MONTH

The Live-stock Situation : Deputation to Mr. Elliot

THE following Press notice was issued by the Ministry on May 17:—

Mr. Elliot, the Minister of Agriculture and Fisheries, to-day received a deputation from the National Farmers' Union of England and Wales, accompanied by representatives of the National Farmers' Union of Scotland, with regard to the live-stock situation. Mr. Ratcliff, the President of the English Union, emphasizing the extreme urgency of the situation with which the live-stock industry is faced, asked the Minister if he could give some assurance that after the end of June all imports of meat and live stock would be so regulated as to secure the restoration of a price level that will avert the bankruptcy of the industry. Mr. Ratcliff also referred to the scheme that had recently been prepared by a sub-committee of the Conservative Parliamentary Agricultural Committee, in collaboration with the National Farmers' Union, embodying a scheme for deficiency payments to home meat producers, on the lines of the Wheat Act. Mr. Ratcliff asked for the Minister's views as to the administrative practicability of proposals on these lines and of the possibility of their acceptance by the Government. Mr. Hutcherson, the President of the Scottish National Farmers' Union, supported Mr. Ratcliff and referred to a resolution passed by the Central Executive Committee of his Union on April 26 requesting the Government to give immediate consideration to the question of the regulation of imports of all classes of meat and live stock irrespective of origin.

Mr. Elliot, in reply, said he felt sure that the deputation would recognize that he could not give categorical answers

NOTES FOR THE MONTH

to questions that involved considerations of the utmost importance from the point of view of the agricultural and economic policy of the whole country. He could, however, give a full assurance that the position was being actively considered in the light of present circumstances. The proposals put forward by the sub-committee of the Conservative Agricultural Committee were being closely examined by the Department. He pointed out, however, that the scheme involved very considerable difficulties and uncertainties, both economic and administrative, and even if these could be surmounted, which no one could at present foresee, it would have to be recognized that any such scheme would involve far more drastic control over producers than the Wheat Act.

Sampling Observations on Wheat : Second Quarterly Report 1933-34

THIS is the second year of the full scheme of sampling observations on wheat under the auspices of the Agricultural Meteorological Committee. A report for the first quarter was included in the March issue of this JOURNAL. The second quarter's report follows here.

The principal event determined in the second quarter is that of tillering, which is arbitrarily defined as the moment when the number of shoots is double the number of plants. The date is intended to be fixed by four weekly observations, two before and two after the actual date. Sometimes for various reasons only three sets have been used. At Cirencester only a rough determination could be made, because before the tillering point had been reached the field was harrowed, and the plants were temporarily buried. At Long Sutton the initially sparse crop was unfortunately almost completely destroyed by wireworm before tillering.

It is gratifying to be able to report that the observations have been made with great regularity this year, and this has greatly facilitated the computations, particularly of the standard error, besides improving the quality of the results.

The accompanying table shows the dates of tillering, the rates in terms of numbers of shoots formed per 100 plants per week, and the plant numbers at tillering. There are ten stations in all, five of them growing three varieties, the other five the two standard varieties, Square Head's Master and Yeoman, only. The stations are arranged in order of sowing date.

NOTES FOR THE MONTH
SAMPLING OBSERVATIONS ON WHEAT 1933-34.
SECOND QUARTER.

Station	Variety	Tillering				
		Date	Standard Error of diff.	Rate. (Tillers per 100 plants per week)	Standard Error of diff.	Density (Plant number per 32 metres)
CIRENCESTER Gloucestershire	Square Head's Master Yeoman	Feb. 26.17 Feb. 20.12	} ± 8.55	13.0 14.0	} ± 3.80	1,011 935
ROTHAMSTED Hertfordshire	Square Head's Master Yeoman Victor	April 1.56 Mar. 27.87 April 5.73		} ± 1.78		24.5 25.0 23.9	} ± 1.57	1,079 919 1,308
PLUMPTON Sussex	Square Head's Master Yeoman	Mar. 16.06 Mar. 12.68	} ± 1.02		35.5 41.2	} ± 3.7 ¹		724 870
SEALE-HAYNE Devonshire	Square Head's Master Yeoman Victor	Feb. 0.53 Feb. 2.13 Feb. 5.37		} ± 1.76	25.8 24.9 25.8		} ± 2.23	814 696 856
WYE ² Kent	Square Head's Master Yeoman	Mar. 28.95 Mar. 29.81	} ± 0.74		43.4 45.4	} ± 4.52		1,111 985
BOGHALL Edinburgh	Square Head's Master Yeoman	Mar. 29.76 Mar. 27.66		} ± 0.58	47.6 42.8		} ± 3.68	939 1,104
NEWPORT Shropshire	Square Head's Master Yeoman	Mar. 25.59 Mar. 28.19	} ± 1.11		47.3 43.5	} ± 3.16		749 682
LONG SUTTON Hampshire	Square Head's Master Yeoman Wilhelmina	Crop destroyed by wireworms during March				
WOBBURN Bedfordshire	Square Head's Master Yeoman Victor	Mar. 19.94 Mar. 21.66 Mar. 23.95	} ± 0.87	31.5 33.1 25.6	} ± 4.22	1,050 769 1,302
SPROWSTON Norfolk	Square Head's Master Yeoman Wilhelmina	April 1.54 April 1.43 April 5.82		} ± 0.94		32.5 39.8 32.0	} ± 3.47	889 1,053 1,094

¹ Tillering calculated from two sets of observations on Jan. 29 and Feb. 12 only. That of Jan. 29 contained 32 quarter-metre samples. Shortly after Feb. 12 the field was harrowed and the plants were temporarily buried.

² Based on 32 three-quarter metre samples at each set of observations.

NOTES FOR THE MONTH

The range in the dates of tillering is much smaller this year than last, both as regards different stations and between varieties at the same station. Seale-Hayne was the first to tiller at a mean date of February 1 for the two standard varieties, and Sprowston was the last at a mean date of April 1. Except for Seale-Hayne and Cirencester all stations and varieties passed the 2:1 ratio during the last three weeks of March and the first week of April.

Last year two stations, Woburn and Seale-Hayne, tillered before the New Year. Long Sutton, the last station to tiller last year, however, was little different from the last station this year, the mean date being March 28, and three other stations last year were all within the last fortnight of March. Thus the wheat plant seems to have behaved very similarly as regards tillering in both years: considerable shoot formation may occur early as the result of some favourable early warm spell, but if not it proceeds with rapidity during the closing weeks of March, and the stations where the plants are most backward then make up for lost ground.

As a consequence the higher tillering rates are generally associated with late tillering. The rates range from 13.0 to 47.6 tillers per 100 plants per week. Thus under favourable circumstances the plants are capable of forming about one shoot every 14 days. The rates last year were a little but not much higher than these.

Plant number at tillering is in most cases very similar to that at the first count (see this JOURNAL, Vol. XL, No. 12, March, 1934, p. 1115) and there seems to have been even less apparent plant elimination than in 1932-33. The variety Victor at Rothamsted has fared notably badly with a loss of 30 per cent. from the exceptionally high value of 1876. At a few stations the plant number has actually increased, at Newport as much as 43 per cent. for Square Head's Master, from the very low density of 524, indicating presumably, delayed germination. This delayed germination may be due to defective seed, which this year had to be treated for smut.

As regards differences between varieties the standard errors of these differences are shown in the table. A difference of twice the standard error may be regarded as significant. There are no significant differences between varieties for rates of tillering, other than the doubtful exception of Sprowston. Dates of tillering, on the other

NOTES FOR THE MONTH

hand, appear to be significantly different for the different varieties at certain stations. The effect is apparently complex, for at some stations Yeoman was earlier than Square Head's Master, and at others the opposite occurred.

A conference of most of the observers of the scheme was held at Rothamsted on March 8 and 9. In addition to various discussions a trial plant and shoot count was made by all observers, leading to some interesting results as to the possibility of observers' bias entering into the somewhat difficult task of determining plant number at the period when tillers are becoming numerous. This has been discussed in detail elsewhere (*Empire Jour. Exper. Agric.* Vol. II, pp. 174-177).

Ventilation of Pig-houses

ALTHOUGH farmers and pig-keepers have shown considerable interest in the Scandinavian type of piggery, and many pig-houses have been built upon what the owners believe to be Swedish or Danish lines, the extent to which those models are followed usually stops at the adoption of the well-known arrangement of the dunging passage. It is by no means certain that we have fully realized the importance attached by the Scandinavians to a good air circulation. The theory underlying their insistence on frequent change of air is as follows:—like all other warm-blooded animals, pigs give off vapour to the air through perspiration from the skin and by breathing, thereby greatly increasing the humidity of the air in the house. This dampness in the piggery is detrimental to the animals, and the aim, therefore, is to remove the humidity by brisk ventilation.

Frequent changes of air, however, naturally lower the temperature unduly during the cold months, and it is with the object of warming the incoming fresh air, rather than for heating purposes, as ordinarily understood, that hot-air stoves are introduced into Danish pig-houses. A comparatively well-insulated building, fully occupied by pigs, will, even if not freely ventilated, become sufficiently warmed by the heat given off by their bodies; but a heating installation makes it possible to ventilate as extensively in the cold season as in the summer months. The chief aim, therefore, is to ensure the same conditions, as regards temperature and freshness, in winter as in summer. To effect this, the incoming air is heated to a temperature only slightly higher

NOTES FOR THE MONTH

than that of the pig-house, so that, by the natural difference in weight between warm and cool air, the incoming air will be evenly diffused over the space. To facilitate the easy movement of the air, it is important that partitions dividing the pens should offer as little resistance as possible; and, to this end, it is advisable that the partitions should be of tubing, wire mesh or, if of board, that the boards should be spaced. The accompanying interior view (Fig. 1), of a pig-house, similar to that illustrated in this JOURNAL for May, 1933, shows this feature very clearly.

The system of air circulation employed in the house here illustrated is the invention of a Danish engineer, Mr. Carl V. Simonsen, and called by him the "S.S." system. Its method of working is indicated in the diagram (Fig. 2). It will be seen that fresh air enters by the stove, is discharged above the pens at a height of 4-5 ft., and moves, throughout the length of the house, to an extract shaft at the opposite end, which, divided vertically, has outlets both near floor level and at the roof level. The warmed but cooling air is thus generally distributed.

It is stated that, with a fattening house containing 80 to 100 pigs, the cost of fuel, for a whole winter, is approximately 1s. 6d. per animal, a sum that is easily saved on food and by increased gain in weight. Further, houses previously damp and unsuitable, may, by good ventilation, be made dry and healthy. The advantages are particularly apparent in the farrowing house, and it is stated that the death-rate among young piglets can be greatly reduced by the installation of warm-air ventilation. Figures are advanced to prove that, for each temperature, there is a corresponding favourable humidity ratio, and rate of air current, for best results. These are given as under:—

<i>Temperature:</i> <i>deg. F.</i>	<i>Humidity:</i> <i>per cent.</i>	<i>Air circulation:</i> <i>inches per second.</i>
57	80	1½
61	65	2½
64	50	4

A thermometer and a hygrometer are suggested as among the items of necessary equipment for a pig-house, but it would appear that any pig-keeper desiring to adopt artificial ventilation would be well-advised to consult an expert. The object of this note is merely to direct attention to an aspect of the Scandinavian system of housing pigs that does not seem to have received much attention in this country.

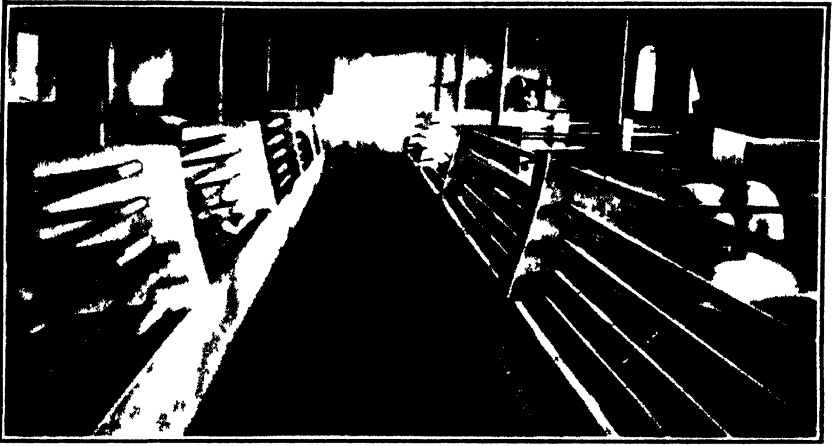


FIG. 1. Interior of pig house showing open rail partitions to permit free diffusion of air.

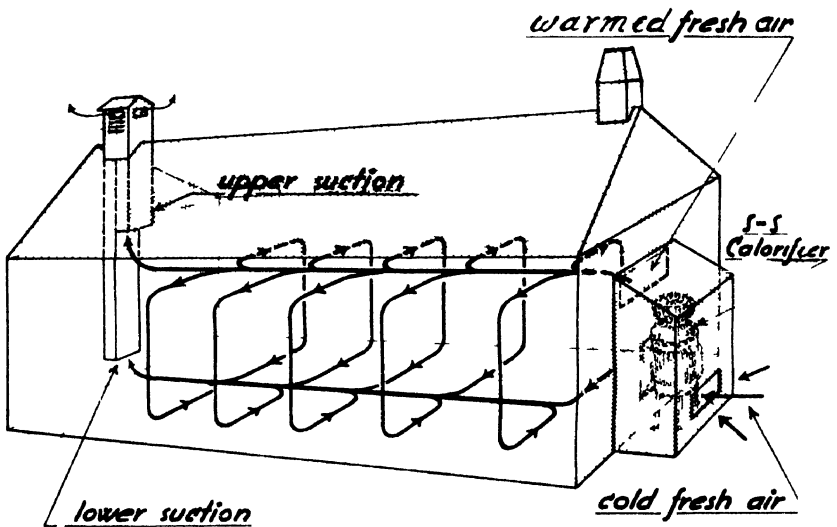


FIG. 2. Diagram illustrating flow of air currents. The Ventilation of Pig houses. The S-S System by the Danish Engineer Mr. Carl V. Simonsen. (See note opposite.)

NOTES FOR THE MONTH

Destruction of Injurious Weeds

THE Minister's powers under the Corn Production Acts, 1917 and 1920, regarding the destruction of certain injurious weeds, were continued in force by the Schedule to the Corn Production Acts (Repeal) Act, 1921.

Where the Minister is satisfied that any of the scheduled weeds, viz., Spear Thistle, Creeping or Field Thistle, Curled Dock, Broad-leaved Dock or Ragwort, are growing upon any land, he may serve upon the occupier of the land a notice requiring him to cut down or destroy the weeds in the manner and within the time specified in the notice, and if the occupier unreasonably fails to comply, he is, on summary conviction, liable in respect of each offence to a fine not exceeding £20 and to a further fine not exceeding 20s. for every day during which the default continues after conviction.

The Minister has delegated these powers to the county agricultural committees by the Agricultural Committees (Injurious Weeds) Order, 1921, but the Minister's consent must be obtained in each case before legal proceedings are instituted against a defaulting occupier.

The number of cases dealt with has increased steadily since the Act was passed in 1921, the figures for the past five years being as follows:—

Cases	Year ended September 30				
	1929	1930	1931	1932	1933
Total number	4,331	5,452	5,734	6,823	7,078
Dealt with by arrangement	4,095	5,150	5,407	6,410	6,601
Notices served	236	302	327	413	477
Prosecutions :—					
Successful	10	10	9	9	13
Unsuccessful	—	—	1	—	—

It will be observed that out of a total of 7,078 cases in 1933, the service of formal notices under the Act was necessary in only 477 cases, or less than 7 per cent., the remainder being satisfactorily dealt with by arrangement between the agricultural committees and the occupiers concerned.

Convictions were obtained in 11 of the instances in which proceedings were taken by reason of the failure of the

NOTES FOR THE MONTH

occupiers to comply with the requirements of the statutory notices served on them to destroy weeds, and fines varying from £10 to 10s. were imposed, together with costs. The other two cases were dismissed on payment of costs.

Occupiers of land are reminded of the necessity of destroying injurious weeds, in their own interest and that of their neighbours, and as the seeds can be spread or carried over a wide area, it is obviously very important that the weeds should be destroyed before they commence to seed.

The authorities concerned in the matter are the Agricultural Committee of the Council for the County in which the land is situated, or, if the land is within a county borough, the Agricultural Committee for the borough—if one has been appointed. The majority of county boroughs, however, have no Agricultural Committee, and in that contingency, communications should be addressed to the Ministry of Agriculture and Fisheries, 7, Old Bailey, London, E.C.4.

Smallholdings (Government Assistance)

IN the House of Commons on May 17, in answer to Colonel Clifton Brown, who asked whether the Minister was in a position to make any statement regarding suggestions which have been put before the Government for the provision on an experimental basis of a certain number of smallholdings for unemployed persons, Mr. Elliot replied as follows:—

I have been in touch with the voluntary bodies and other persons interested in this subject, and as a result, the possibility of constituting a Smallholdings Association for England and Wales is being actively considered. The immediate object of such an association would be to provide, by way of experiment, a number of smallholdings for intensive cultivation by suitable unemployed persons. In the event of such an association being formed, the Government would be prepared to contribute up to £50,000 per annum over a period of three years on a basis of £1 for every £2 raised by the association by way of gift in money or its equivalent from non-State sources. In this connexion, I am glad to be able to inform the House that Mr. P. Malcolm Stewart has signified his willingness to offer to such an association, if and when formed, on the basis indicated, an estate of some 700 acres at Potton in Bedfordshire.

SPECIFICATIONS FOR CERTAIN INSECTICIDES AND FUNGICIDES

THE standardization of insecticides and fungicides has for some years been a subject for discussion, among both the users and manufacturers of these chemicals; and representations have from time to time been made to the Ministry by organizations of farmers or growers asking that steps should be taken to require a guarantee of the content of active materials in these products. The first step in this direction was made soon after the War when a Committee of the Chamber of Horticulture, in co-operation with the Board of Agriculture, prepared specifications for a certain number of the more important insecticides and fungicides then in use. These specifications have been published in one of the Ministry's leaflets (Advisory Leaflet No. 9). Since then, there has been a great development in the employment of insecticides and fungicides, and a great number of new products have come into general use. Technical knowledge, unfortunately, is still hardly sufficient to enable satisfactory specifications to be drawn up for all the important insecticides and fungicides, and, moreover, a declaration of chemical composition is not always a complete guide to the efficacy of a product in practice, since such factors as the physical condition of the components are also of great importance and cannot at present be fully specified. Some further advance, however, is now possible.

As a result of discussions between representatives of the National Farmers' Union, the insecticide and fungicide makers and the Ministry, the Association of British Insecticide Manufacturers undertook to bring up to date the specifications published in Advisory Leaflet No. 9, and to add specifications for certain compounds not previously dealt with: these latter include copper fungicides for potato-spraying, which had been specially mentioned by growers' representatives as having caused difficulty. The Association has now prepared these specifications, which have been accepted by the Government Chemist, the National Farmers' Union, and the Ministry, and which are printed below: in addition, and no less important, agreed methods of analysis* have been drawn up in connexion with the

* The greatest care must be exercised in taking samples for any purpose. They must be truly representative of the bulk of the material, otherwise misleading results will be obtained.

INSECTICIDES AND FUNGICIDES

specifications, for the use of analytical chemists, and will be published with the specifications by the Ministry in a separate Bulletin.

Members of the Association of British Insecticide Manufacturers, and certain other firms, have agreed to conform to these standards, and purchasers of the insecticides and fungicides in question are strongly advised to require a guarantee that materials supplied shall comply with these specifications. By so doing, they will make certain of obtaining standard products of high quality.

The detailed specifications are as follows:—

SPECIFICATIONS FOR CERTAIN STANDARD PRODUCTS.

1. Lead Arsenate.*—The lead arsenate used in this country is the di-plumbic arsenate (PbHAsO_4). The specifications given below apply to this form.

(a) *Lead Arsenate Powder*.—Lead arsenate powder shall be a fine powder free from lumps and grit.

It shall contain not less than 31 per cent. of arsenic calculated as arsenic pentoxide (As_2O_5), not less than 63 per cent. of lead oxide (PbO) and not more than 0.5 per cent. of water-soluble arsenic expressed as arsenic pentoxide (As_2O_5) when tested in the prescribed manner. It shall conform to the limit test for acidity.

Note.—Some manufacturers offer powder lead arsenate containing spreaders or wetting agents. In such cases the above limits may not apply, and in these circumstances the manufacturer should declare the total contents of arsenic pentoxide and lead oxide and the maximum amount of water-soluble arsenic present.

(b) *Lead Arsenate Paste*.—Lead arsenate paste shall be of a uniform smooth consistency, free from lumps and hard particles, and shall readily rub down to a fine cream with water. It shall consist essentially of a mixture of di-plumbic arsenate (PbHAsO_4) and water. The paste shall contain not less than 14 per cent. of arsenic calculated as arsenic pentoxide (As_2O_5) and not less than 28.4 per cent. of lead oxide (PbO). It shall conform to the limit test for acidity and shall not contain more than 0.5

* There are certain factors affecting the efficiency of this product which it is not possible to define with certainty in the present state of knowledge. A specification which will afford a complete guide to efficiency cannot be prepared at present. The user is, therefore, advised in his own interests to purchase only the products of reputable British manufacturers as this will be his best safeguard.

INSECTICIDES AND FUNGICIDES

per cent. of water-soluble arsenic expressed as arsenic pentoxide (As_2O_5) calculated on the dry basis.

The manufacturer shall declare the percentage of arsenic expressed as arsenic pentoxide (As_2O_5) in the paste. Pastes are normally sold with a content of either 15 per cent. or 20 per cent. of arsenic pentoxide (As_2O_5).

2. Lime-Sulphur Solution.*—Lime-sulphur solution shall be clear and free from sludge and shall have a specific gravity of approximately 1.3. It shall contain not less than 18.5 per cent. weight in weight of polysulphide sulphur equivalent to approximately 24.0 per cent. weight in volume, as determined by the prescribed method.

3. Nicotine and Nicotine Sulphate.—The manufacturer shall declare the content of nicotine in the material and that it is substantially free from coal tar bases.

Note.—Purchasers should note that while the term "Nicotine" is generally understood to mean a pure or commercially pure product of 95 to 98 per cent. strength, it is often loosely employed by some sellers to designate nicotine sulphate containing 40 per cent. of nicotine or materials containing between 40 and 95 per cent. of nicotine.

4. Copper Sulphate.—Copper sulphate shall contain not less than 98 per cent. of crystallized copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) when tested by the prescribed method.

5. Bordeaux Powder.*—Bordeaux powder is composed of copper sulphate and lime (calcium oxide or hydroxide). The equivalent content of copper (Cu) shall be declared. The powder shall contain no water-soluble copper.

6. Burgundy Powder.*—Burgundy powder is a mixture of copper sulphate and sodium carbonate. The equivalent content of copper (Cu) shall be declared. The powder shall not show more than 2 per cent. alkalinity expressed as sodium carbonate (Na_2CO_3) when tested by the prescribed method and shall contain no water-soluble copper. The whole of the powder shall pass through a 30-mesh British Standards Sieve (B.S.S. 410/1931).

7. Cheshunt Compound.—Cheshunt compound consists of a mixture of two parts by weight of copper sulphate and

* There are certain factors affecting the efficiency of this product which it is not possible to define with certainty in the present state of knowledge. A specification which will afford a complete guide to efficiency cannot be prepared at present. The user is, therefore, advised in his own interests to purchase only the products of reputable British manufacturers as this will be his best safeguard.

INSECTICIDES AND FUNGICIDES

eleven parts by weight of ammonium carbonate, as defined by the Cheshunt Research Station. It shall contain not less than the equivalent of 3.8 per cent. of copper (Cu), when tested by the prescribed method.

8. Soft Soaps for Spraying Purposes.*—When tested by the prescribed methods, soft soap for spraying purposes shall conform to the following requirements:—

- (1) It shall dissolve completely in distilled water to a clear solution.
- (2) It shall contain not more than 1 per cent. of free caustic alkali, calculated as potassium hydroxide (KOH) and not more than 3 per cent. of free alkali carbonate, calculated as potassium carbonate (K_2CO_3).
- (3) Not less than 95 per cent. of the total alkali expressed as potash (K_2O) shall be potash (K_2O).
- (4) The percentages of fatty and of resin acids shall each be declared.

9. Cyanides.—(a) *Sodium Cyanide*.—Sodium cyanide shall contain not less than 97 per cent. of sodium cyanide.

Note.—The strength of sodium cyanide is frequently expressed in terms of potassium cyanide. Since 100 parts of pure sodium cyanide are equivalent, as regards hydrocyanic acid content, to 132.8 parts of potassium cyanide, sodium cyanide of 97-98 per cent. strength is often spoken of as "129-130 per cent. cyanide."

(b) *Potassium Cyanide*.—Potassium cyanide shall contain not less than 93 per cent. of potassium cyanide.

(c) *Calcium cyanide*.—Calcium cyanide shall contain not less than 40 per cent. of calcium cyanide.

10. Formaldehyde.—Commercial formaldehyde (sometimes called Formalin) is essentially a colourless solution of formaldehyde in water, neutral or faintly acid to litmus.

It shall contain not less than 36 and not more than 40 per cent., weight in volume, of formaldehyde ($H.CHO$), when tested by the prescribed method.

* There are certain factors affecting the efficiency of this product which it is not possible to define with certainty in the present state of knowledge. A specification which will afford a complete guide to efficiency cannot be prepared at present. The user is, therefore, advised in his own interests to purchase only the products of reputable British manufacturers as this will be his best safeguard.

PIGGERIES AT THE AGRICULTURAL RESEARCH INSTITUTE FOR NORTHERN IRELAND

R. RAE, B.Agr.,
Professor of Agriculture, University of Reading.

THE adoption of the recommendations of the Bacon Reorganization Commission, and the prospect of a fixed minimum price, have greatly increased the general interest in pig keeping. The price is stated to be sufficient to cover the cost of production, and is based on the cost of a standard ration together with the assumption of adequate results from breeding and feeding. In other words, a reasonably high weaning average and fair rate of live-weight gain in relation to food consumed have been taken as the basis on which that portion of the minimum price has been calculated. The better the results, obtained by an individual farmer, above these averages, the greater does the margin of profit become. Breeding, feeding and good housing are all of special importance in successful management. Indeed, it may be said that suitable and well-constructed buildings are an essential preliminary if optimum results are to be obtained from successful breeding and feeding. This article is concerned with the design and erection of a set of buildings for the rearing and fattening of pigs.

Design and Erection of Buildings.—As the only building available for pigs, at the farm of the Agricultural Research Institute for Northern Ireland, was a small, badly-ventilated house, it was decided to utilize it for another purpose and erect a new set of buildings on modern lines. In planning these buildings, the essential points to be observed were that they should be dry, comfortable, well lighted and well ventilated, but free from draughts. Further, they should be arranged to give maximum convenience in feeding and cleaning with the minimum of labour. Buildings in which these essential points have been provided ensure less trouble from many common diseases, and, therefore, healthier and more thrifty pigs. The work of attending to the pigs can be carried out with greater ease, speed and comfort, and this means increased interest and

THE PIGGERIES AT A RESEARCH INSTITUTE

efficiency, leading to better results. In addition, the attendant will be able to look after a larger number of pigs.

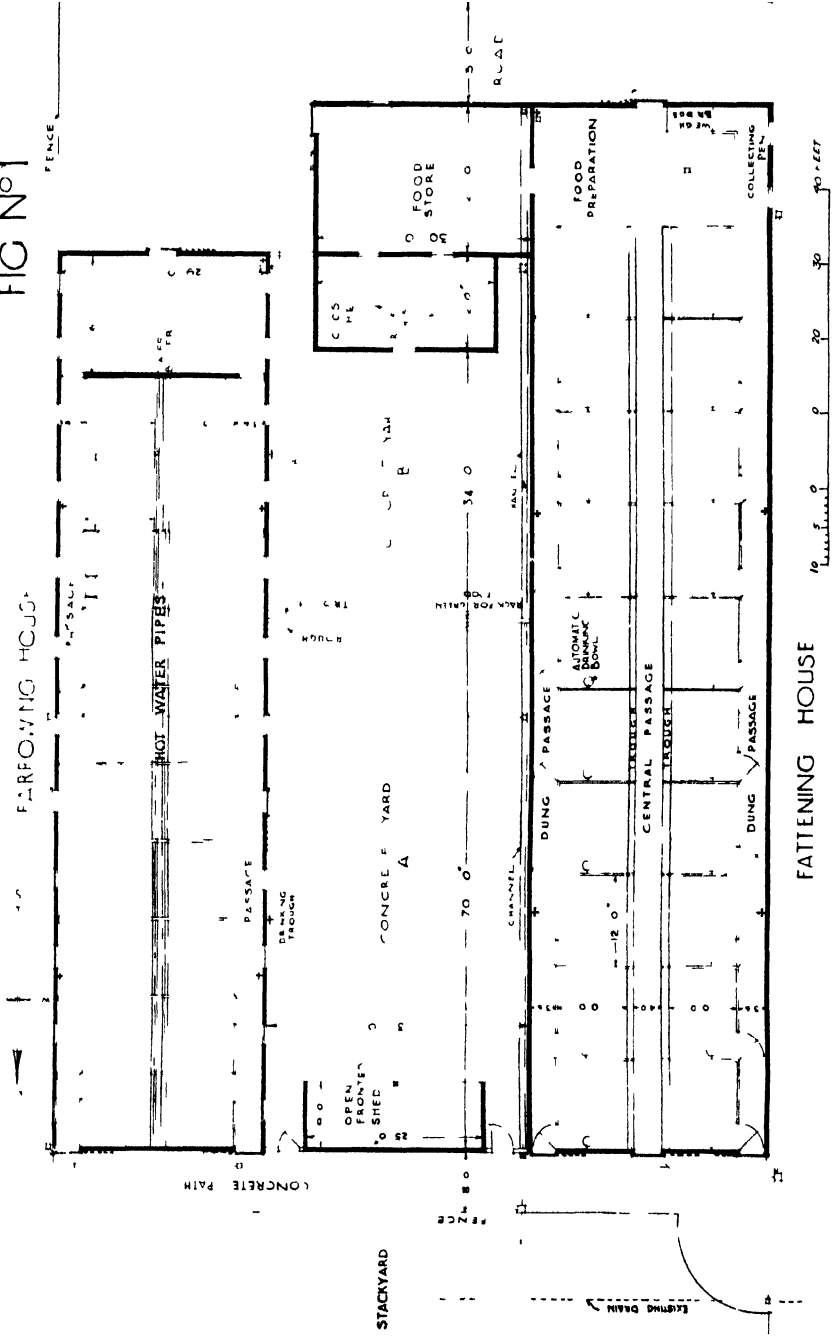
The buildings were planned by the staff of the Institute, and they were erected entirely by the farm staff. An estate carpenter and a blacksmith are on the permanent staff of the Institute, and these men, with the assistance of ordinary farm labourers, carried out all the building work, which was completed in the summer of 1933.

Scope of the Buildings.—The herd consists entirely of pedigree Large Whites, and the function of the plant is (a) to provide material for experiments on the nutrition of pigs, and (b) to build up a first-class breeding herd, based on records. The buildings were designed to provide accommodation in which approximately 40 sows could be farrowed twice annually, and in which such of the progeny as were not retained, or sold, for breeding could be fattened. The plant consists of a farrowing house of twenty pens, a fattening house capable of housing 200 pigs up to bacon weights, a concrete yard and a food store.

Construction and Building Materials.—*Site.*—The site chosen was a piece of waste ground adjacent to the main farm buildings, and on the side of a farm road running north and south. Fig. 1 gives a ground plan of the buildings. The fattening house was built parallel and close to the road, the farrowing house parallel to the fattening house and the space between these two buildings was made into a concrete yard. The houses run north to south, the long walls facing east and west. In buildings where there are double rows of pens this is a desirable aspect, for, provided windows and roof-lighting have been installed, it ensures that one row of pens has the sunlight in the morning and the other row in the afternoon. The site was also convenient in being in close proximity to the covered dung shed and main drainage system.

Farrowing House.—The overall, outside dimensions of this house are 116 ft. by 30 ft. and the walls are 8 ft. high to the eaves. It was decided to use Aerocrete blocks for the construction of the external walls. Aerocrete is a proprietary material and the standard size of a block is 28 in. by 9½ in. by 6 in. In appearance it resembles concrete but is cellular in structure and it is claimed that it is a poor conductor, possessing better insulatory properties than concrete or brick. The blocks are light and easily handled,

FIG N^o1

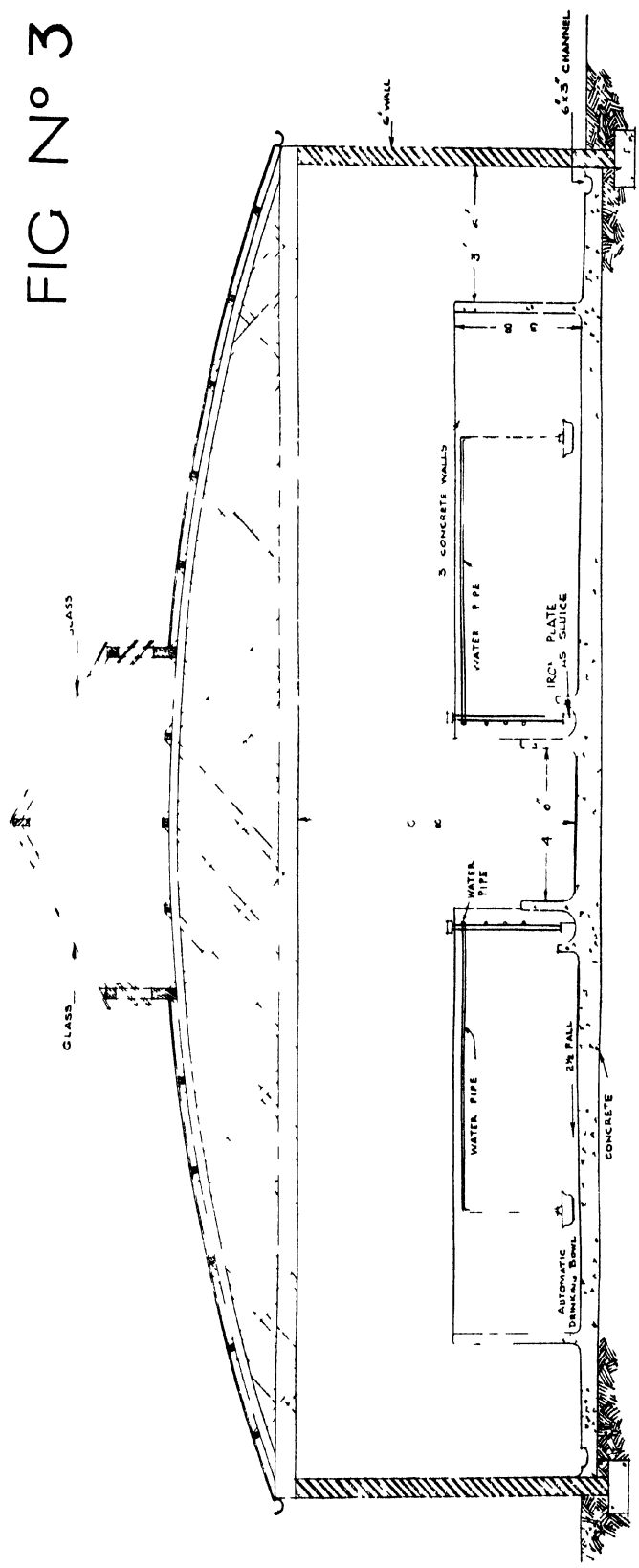


FATTENING HOUSE

FARM ROAD

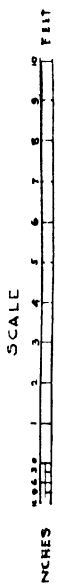
Piggeries for the Agricultural Research Institute of Northern Ireland General Plan

FIG N° 3



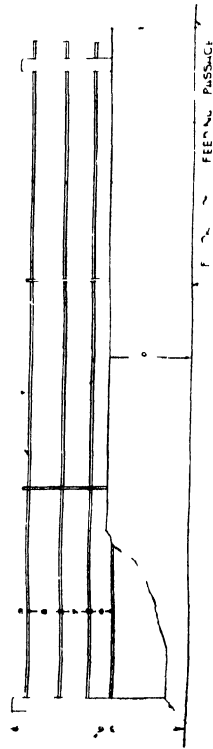
CROSS SECTION

FATTENING HOUSE



Figures for the Agricultural Research Institute of Northern Ireland.

FIG N° 4

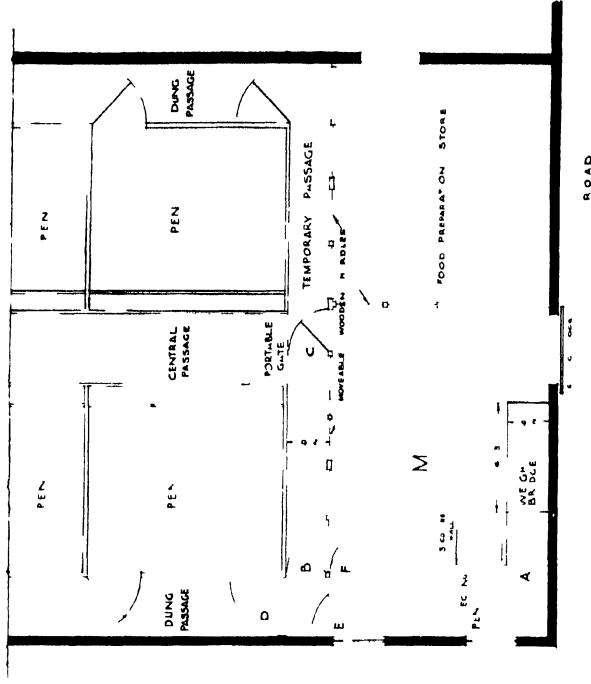


FRONT ELEVATION
OF PEN

FATTENING HOUSE

SCALE 1" = 10' 0"

FIG N° 5



PART PLAN SHOWING
WEIGHING ARRANGEMENTS

FATTENING HOUSE

SCALE 1" = 10' 0"

THE PIGGERIES AT A RESEARCH INSTITUTE

and, as no shuttering is required, building can proceed at a rapid pace. Concrete can be mixed quickly and relatively cheaply where mechanical means are available, but on the average farm, where the work of mixing would normally be done by hand labour, it would have been a slow and laborious job to mix the quantity of concrete necessary for the external walls. The use of the Aerocrete blocks made this work unnecessary. When the question of time, the purchase of shuttering and the fact that there is no sand on the farm were considered, it was found that it was cheaper to use Aerocrete than concrete for the external walls. All partition walls throughout the building have been constructed of reinforced concrete.

The Aerocrete blocks were supported, at intervals of 10 ft., by 6 in. iron stanchions sunk 2 ft. in the ground in concrete. The blocks against the stanchions were cut away and fitted between the flanges. At the food store end, the stanchions are at intervals of 8 ft. to suit the size of the store. Except at the corners, no stanchions were used at the ends. A 4-ft. sliding door gives access to the house at the food store end, and a 3 ft. 6 in. sliding door is situated at the end of each of the two passages at the north end. Metal windows, 3 ft. square, with the top half opening inwards, were built in the long walls—one window opposite each pen. The internal arrangement, as shown in Fig. 1, consists of two rows of ten pens each, set back to back. Each pen is 10 ft. by 10 ft., with a door that opens across the passage and may be fixed in that position when necessary. A farrowing rail made of 1 in. (internal diameter) galvanized piping, placed 10 in. above the floor and 10 in. from the walls, runs round each pen, and a glazed-earthenware feeding trough, bedded in cement, is placed in one corner. A small food store, 16 ft. by 29 ft., is situated at one end of the house and divided from the remainder by an Aerocrete wall built up to the roof truss. A small hot-water boiler is placed against this wall and is connected to four pipes, two flow and two return, running the entire length of the house between the two rows of pens. The pipes are protected at the sides marked A, on Fig. 2, by iron railings, and the full benefit of the heat is allowed into the pens. The climate of Northern Ireland is not suitable in winter for farrowing sows out of doors, and experience has shown that in large houses some form of artificial heating is advisable in winter.

THE PIGGERIES AT A RESEARCH INSTITUTE

To combine all the desirable qualities in the floor, in many respects the most important part of the building, is a very difficult problem. For durability, cleanliness and cheapness a floor of cement-faced concrete is probably the best, but it has two disadvantages: it is cold and apt to be damp, and, even when only slightly dirty, it becomes very slippery. The slippery effect can, in large measure, be overcome by leaving the surface slightly roughened by wire-brushing; and all passage ways, at least, should be finished in this fashion. The tendency of concrete to lie cold and damp is in the main due to the conductivity of the concrete with the underlying soil. If this conductivity is broken, then there appears no reason why concrete should not form a suitable floor. A number of other types of floors such as cork brick, Aerocrete, asphalt, etc., were considered, but all were discarded on account of expense. Concrete floors were laid down but, in the pens, the concrete is never more than 2 in. in depth, and is laid on 6 in. of clinkers over a bed of broken stone, thus breaking the conductivity of the concrete with the underlying soil. So far the floors have proved satisfactory. A certain amount of straw has been used for bedding in the farrowing house but, in the fattening house, the pigs lie on the concrete.* The floors in each pen have a fall to the door, and all liquid is carried away by a channel in the passage way that has a fall of 6 in. from south to north.

The roof, a cross-section of which is shown in Fig. 3, is constructed throughout of timber. Wooden "Belfast" trusses are carried on the iron stanchions and the roof itself consists of $\frac{3}{4}$ -in. sawn boards covered by a high-quality bitumen roofing felt that does not require annual tarring. A lantern light, running the entire length of the house, gives approximately 5 ft. of glass on either side of the apex. The three panes of glass in the roof, above the centre point of each pen, are Vita glass of the cathedral type, the remainder of the lantern light being ordinary glass of the same type to prevent scorching. Ample louvre ventilation is provided along both sides. In very severe weather, some form of shutters may be necessary.

Fattening House.—The overall dimensions of this house are 136 ft. by 34 ft. The construction of the floor, walls and roof are the same as in the farrowing house except that Vita glass was not used, and that there are no windows in the side walls except at the food store, where there is no



To face page 232.

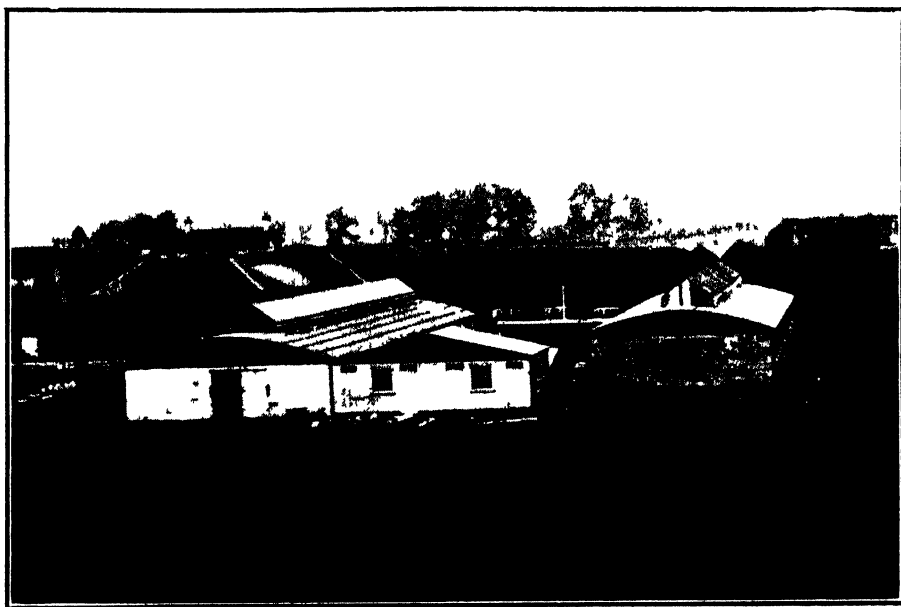


FIG. 7 —View from the South

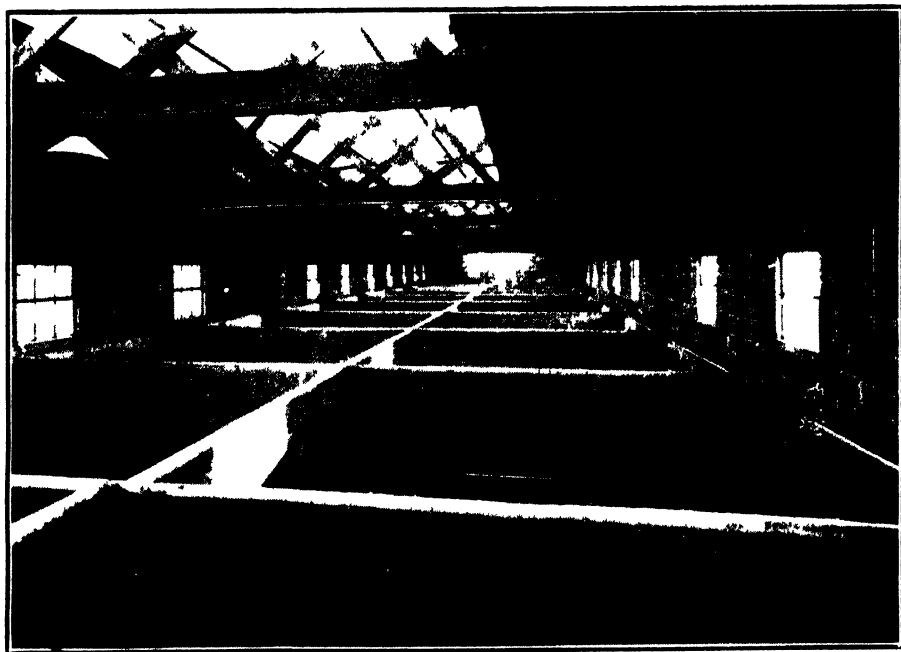
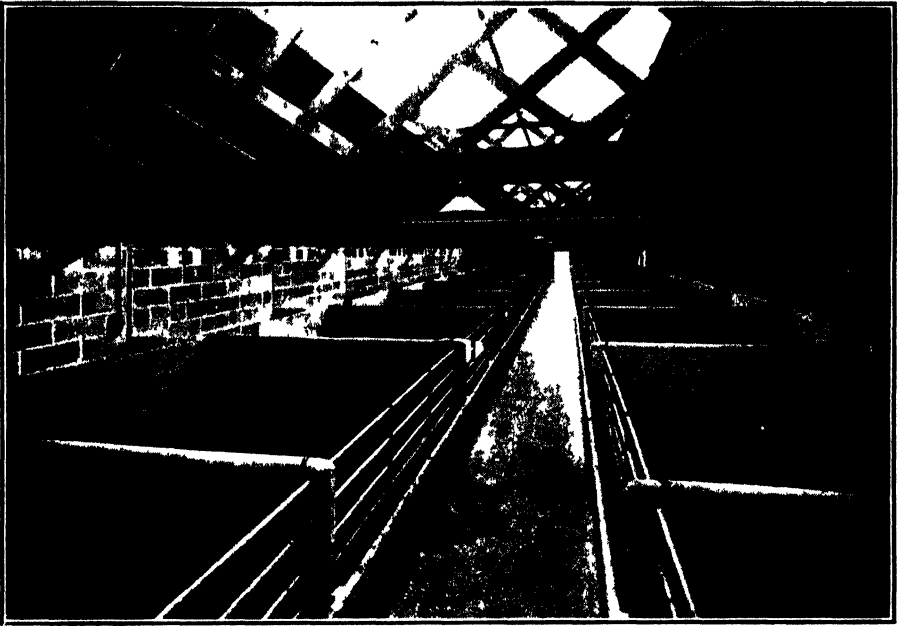


FIG. 8 —Interior of the farrowing house

Piggery for the Agricultural Research Institute of Northern Ireland



16-9 Interior of fattening house



16-10 Detail view of pen in fattening house showing arrangement for swilling troughs (See p. 233)

Piggeries for the Agricultural Research Institute of Northern Ireland

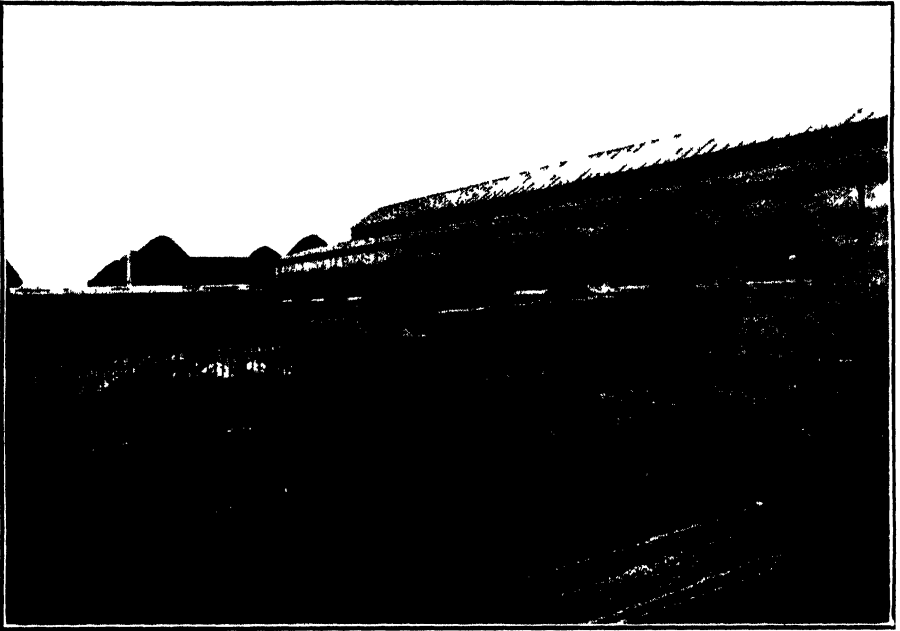


FIG. 11 North end of the Yuid

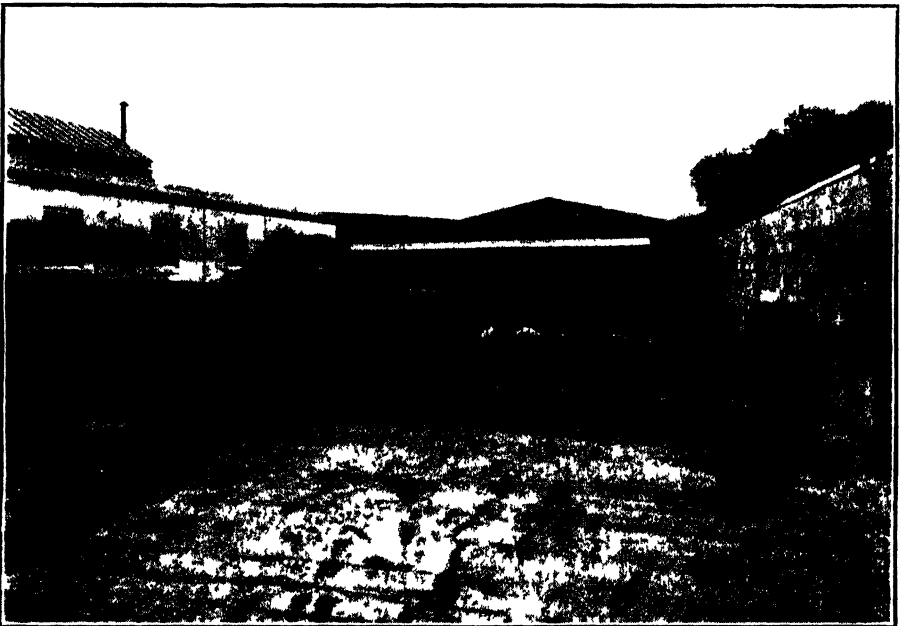


FIG. 12 South end of the yard

Piggeries for the Agricultural Research Institute of Northern Ireland

THE PROGRESS AT A RESEARCH INSTITUTE

roof lighting. With walls only 8 ft. high, the effective light from side windows does not get past the passages and, as the roof lighting was on so generous a scale, the side windows were omitted in this house. Ventilator blocks were inserted along both walls below the eaves.

In the internal arrangements, this house follows closely on the lines of the Danish type of house. It consists of two rows of ten pens each with a central passage, and behind each row of pens is a dung passage. Each pen has a door that may be closed against the pen wall or the passage wall. When all doors are closed against the passage wall, the pigs have access to a portion of the dung passage in addition to their pen. An automatic drinking bowl has been installed in each pen and when the pigs are first brought into this house the method adopted to train them to use the dung passage has been to depress the tongue of the drinking bowl and allow the water to run into the passage. The pigs have followed the water and commenced to urinate. This procedure has only been adopted once with each group and, after a few days, practically no dung or urine is seen in the pen. This arrangement of the pens offers two advantages: (1) the pigs always lie clean and dry in their pens, and (2) the labour and time involved in cleaning is materially reduced. When cleaning is in progress, the pigs are shut in the pens, and the dung passage thus becomes a clear way that can be easily and quickly brushed out and hosed.

The trough for each row of pens is formed from semi-circular glazed channel pipes, 12 in. in diameter, laid end to end in a continuous line the entire length of the house. The troughs were bedded in concrete and have a fall of 6 in. in the length of the house. A small opening was cut where each pen partition wall crosses the trough, and, by means of a small iron plate attached to an upright and handle, the opening is closed during feeding and opened for cleaning. This arrangement can be seen in Fig. 3 and in one of the views (Fig. 10). It reduces materially the time involved in cleaning the troughs as, with the fall of 6 in. and when all the iron plates are raised, the trough can be hosed from one end of the house to the other.

Fig. 4 shows the method adopted to close the front of the pens against the central passage. A small concrete wall is continued from the top of the trough (see Fig. 3) to a height of 20 in. from the ground level. Four $\frac{1}{2}$ -in.

THE PIGGERIES AT A RESEARCH INSTITUTE

galvanized pipes, carried through the partition walls, are spaced at intervals to form the remainder of the front of the pen. These pipes are supported at two points by iron bars which are turned and embedded in the concrete wall. The bottom pipe is just below the level of the concrete wall and, in Fig. 4, a portion of the concrete wall is shown cut away to illustrate the position of this pipe. It is important to have this pipe in the correct position, or there might be a danger of little pigs climbing from the trough over the concrete wall into the central passage. The top pipe is used to carry water and the automatic drinking bowls are fed from it.

The pigs in this house will normally be used for experiments in nutrition, and frequent weighing will be required. Fig. 5 shows the arrangements made for this purpose. The weighbridge is placed against the south wall, and a small concrete wall has been built from it to form a collecting pen. On weighing days movable wooden hurdles are fixed into permanent holes sunk 4 in. in the floor, the hurdles being held together by iron clasps. The hurdles and gates are indicated by dotted lines in Fig. 5, and are so arranged that, by placing the gates in the desired positions, the pigs from any pen must go straight to the collecting pen. After passing over the weighbridge each pen of pigs is held in the space M and then, by opening gate C or F, pigs are allowed to run back to their respective row of pens. Gate E closes the collecting pen; gate D closes the west passage when pigs from the east row are being weighed, and gate B closes the temporary passage when pigs from the west row are being weighed. A portable gate G closes the central passage. Gate A, which by a counter-weight slides upwards, keeps the pigs from the weighbridge and allows the gate of the bridge to be opened to receive the next pig from the collecting pen.

Food Stores.—A food store, 30 ft. by 20 ft., adjoins the fattening house and has a communicating doorway to that house. At the other end of the store, there is a 4-ft. sliding door which opens on the widest part of the road, where carts or lorries have ample room to turn. The small store at the end of each house is used mainly for the preparation of food, while this main store houses the large number of bins required for the various experimental groups. A portion of this store may be partitioned off for the storage of potatoes.

THE PIGGERIES AT A RESEARCH INSTITUTE

Concrete Exercise Yards.—The area between the two main houses was laid down in concrete and divided to form two exercise yards. On either side of one-half of the partition wall a concrete feeding-trough was made, while on the other half an iron rack was built into the wall (see Figs. 11 and 12). A small concrete drinking trough was also made in each yard. Approximately two-thirds of the area was allocated to yard A, which measures 70 ft. by 37 ft. At the north end of this yard, an open-fronted shed, 25 ft. by 9 ft., was erected. The shed is 4 ft. high at the wall side and 7 ft. at the front. A sliding door on the west wall of the farrowing house provides communication between that house and the yard. It has already been stated that the climate of Northern Ireland is not suitable for a general scheme of outdoor farrowing, and the purpose of this yard is to provide an exercise ground for the nursing sows and their progeny. Litters of approximately the same age, with their dams, are allowed out together and the time allowed for exercise depends on the weather and on the number of other groups requiring exercise. With the provision of this yard, the small pigs get plenty of exercise, fresh air and direct sunlight, and, as compared with grass, are only short of green food. Lucerne, clover and grass mixture, cabbage or other green food that may be available is placed in the iron rack that is accessible to both yards. The advantage over a permanent grass paddock is that the concrete yard is easily brushed and cleaned, and, as the farrowing house lies on higher ground than the fattening house, the yard has a good slope from east to west and is thoroughly washed by every shower of rain. It cannot be too strongly emphasized that there is no greater potential source of trouble than a small permanent grass paddock that is continually stocked with pigs and becomes thoroughly puddled and contaminated. The opinion is held very strongly that the concrete yard is an essential part of the type of plant under discussion.

Yard B, which is 34 ft. by 37 ft., has a closed-in shed 25 ft. by 12 ft. at the north end and is intended for in-pig sows. A small wood on one side of the plant, in which a shelter has been erected, is used for the growing gilts, while a portion of another wood on the other side is used for dry in-pig sows. The in-pig sows and gilts are brought to yard B when some weeks off farrowing, according to weather conditions, and remain in this yard until 8-10 days

THE PIGGERIES AT A RESEARCH INSTITUTE

from the date when they are due. They are then transferred to a pen in the farrowing house in time to become accustomed to their new surroundings before farrowing.

Drainage.—The drainage system is indicated by dotted lines in Fig. 1 and the position of the various manholes is also shown. The two large houses have a fall from south to north, and the drainage from all passages passes out at the north end, where it is grouped and then linked up with an existing main drain that comes through the stackyard and runs into a tank in the dungshed. Where drains are shown passing through any portion of the buildings it should be noted that these drains only carry rain water or water used for washing. No drains carrying sewage pass through, or underneath, any building. The concrete yards are drained by an open surface channel that lies behind the east wall of the fattening house.

Water and Light.—The main water supply of the farm is carried down the side of the road where the plant has been erected and this supply was connected up to the buildings. Each pen in the fattening house has an automatic drinking bowl and the position of water taps is indicated by crosses on Fig. 1. There are six taps in the farrowing house, five in the fattening house and two in the concrete yards. Experience in other buildings on the farm has shown that it is an advantage to increase the number of taps and thus reduce the length of individual hose pipes required. Longer lengths of hose pipe appear to suffer greater damage and wear out quicker than short lengths, and in consequence the replacement figure is materially affected. Electric light has been installed throughout.

Roads and Paths.—A road was made at right angles from the farm road past the south end of the buildings. This road is 13 ft. in width where it touches the fattening house and main food store, and widens out to over 30 ft. at the farrowing house, so providing room for the turning of carts and lorries. A concrete path, 8 ft. wide, completes the plant at the north end. This path is utilized for the movement of pigs from one house to the other and to the concrete yard. It also provides a road for the attendant when wheeling the dung barrow to the shed.

Cost of the Plant.—Full and detailed cost accounts of all departments of the farm, cost of erection of buildings,

THE PIGGERIES AT A RESEARCH INSTITUTE

etc., are kept at the Institute, and the figures given here are extracted from these accounts. The cost is shown separately for each of the main houses, the concrete yard and sheds, and the main food store. The site selected for the buildings was very uneven and involved considerable levelling and filling up at places with large stones. The extent to which such work is necessary will vary in each particular case, and the amount of road-making involved will also be a variable factor. The cost of these works has therefore been omitted from the total cost figure, but it may be mentioned that, in this instance, the cost of levelling the site, quarrying, carting and laying stones on the site and for the roads amounted to £66. In the table are given details of the cost of labour and of the main items used for construction. No charge has been made for supervision.

TABLE OF COSTS.

	<i>Farrowing House.</i>	<i>Fattening House.</i>
Labour, men	229	209
" horses	6	4
Aerocrete blocks, lintels and cills	92	94
Aerowash	5	5
Roofing timber, felt, etc.	141	170
Glazing	55	47
Windows	22	4
Sand, cement, stones, etc.	74	87
Iron stanchions, iron, spouting and sundries	90	83
Water-piping, taps, bowls and rails	21	60
Troughs	10	29
Boiler and hot-water pipes	44	—
Weighbridge	—	26
	£789	£818
	<i>Foodstore.</i>	<i>Concrete Yard and Sheds.</i>
Labour, men	15	31
Aerocrete	9	8
Roofing felt and solution	5	—
Windows	2	—
Sand, cement, stones, etc.	5	30
Timber, irons and sundries	14	21
	£50	£90
 TOTAL COST OF PLANT.		
Farrowing House		789
Fattening House		818
Food Store		50
Yard and Shelters		90
		£1,747

THE PIGGERIES AT A RESEARCH INSTITUTE

The two large houses cost practically the same, £789 for the farrowing house and £818 for the fattening house, although the overall dimensions of the latter house are considerably greater. The comparatively high figure for Aerocrete charged against the farrowing house, as compared with practically the same figure for the fattening house, is due to the fact that, in the latter house, there are only four windows; and that, although more standard size blocks were required, there were relatively few lintels and sills. The omission of the side windows in the fattening house made a considerable reduction in the cost of that house. The higher cost for glazing in the farrowing house is due to the partial use of Vita glass in the roof of that house. Under the item sand, cement, stones, etc., purchased sand cost 5s. per ton delivered at the farm, cement 55s. per ton, and stones, which were quarried on the farm and then put through the Institute's stone breaker, have been charged at 5s. per ton. Iron stanchions, iron spouting and sundries form rather a conglomerate grouping, and include the iron stanchions that support the wall, spouting and down pipes, gratings, bolts, nails and other sundries. It also includes all other iron, and, as a considerable amount of iron was used in the farrowing house to protect and keep the pigs from the hot-water pipes, the item under this heading is again larger for that house.

The figures given represent an accurate record of the cost of the buildings, but no claim is made that they represent a general cost for such a plant. Their value is simply a record of what it has cost to erect a set of buildings, of the types and dimensions described, on one farm employing farm labour under the direction of a general handyman, and with the assistance of a blacksmith. Different prices for materials and labour, more efficient or less efficient than those employed on the Institute farm, will make material alterations in the cost.

The plant has been inspected by more than one building contractor, and the price placed on the buildings has invariably been higher than the cost given in this paper.

The buildings have created considerable interest and a number of farmers have decided to erect buildings on similar lines, while others have obtained ideas which they state they will incorporate in buildings they intend to renovate and remodel. It may be of interest to record that the cost to one farmer who has completed the erection of a farrowing

THE PIGGERIES AT A RESEARCH INSTITUTE

house on identical lines to the plan given, was very similar but slightly higher than that shown in the table.

Possible Alterations.—It is a common statement that one can generally do a particular piece of work better the second time, and doubtless the buildings described form no exception. Some minor alterations would certainly be made, if the undertaking were to be commenced anew. It would have been an advantage to have a passage, at the north end of the farrowing house, connecting the two rows of pens. At present, when sows are moved from one row to the other they must be driven out of one door on to the concrete path and then in the other door, or they must be driven through the food store. In the fattening house the dung passages for older pigs are on the narrow side, and 4 ft. would be a more desirable width than the present dimensions of 3 ft. 6 in. The same criticism applies to the farrowing house, where it would also probably be better to have the passage 4 ft. in width.

Other points for criticism may arise, but both houses have now been in use for some months and have proved entirely satisfactory. The pigs appear to be comfortable and are thriving, there is ample light and ventilation, and the work of feeding and cleaning is done with comfort and convenience.

It is not suggested that the entire plant that has been described is the best or even acceptable for all conditions. It materialized as a result of considerable thought and work to suit local climatic conditions and the requirements of the Institute. Publication of the plans is made in the hope that they contain some ideas that may be helpful to others who are considering the building of pig houses.

The thanks of the writer are due to two of his former colleagues, Mr. R. W. Hale, the Secretary of the Institute, who supplied the details of the costs from the Institute's Cost Accounts, and Mr. G. Low, the Farm Manager, who supervised the erection of the buildings and contributed in no small measure to the conception and planning of the entire plant.

THE GERMAN FAT MONOPOLY

The Economic Background.—The consumption of edible fats in Germany has increased considerably since the Great War. The use of butter and lard has increased little if at all, but the amount of margarine consumed per head of the population has more than doubled.

The change in the German consumption of the chief edible fats is shown below¹:—

	Consumption		Of German Origin	
	1913	1932	1913	1932
Butter	456	465	400	395
Lard	230	228	123	120
Margarine ..	200	525	—	—

The per capita consumption of these fats has changed in the following way²:—

	(Kilogrammes per head.)				
	1913	1925	1928	1931	1932
Butter	6.80	5.66	7.10	7.36	7.10
Lard	3.43	3.06	3.33	3.22	3.46
Margarine ..	2.99	6.49	7.45	7.32	7.82

Not only has the consumption of margarine increased, but the German margarine industry in 1932 used more foreign raw materials, and more margarine was imported than in 1913. According to an official statement by the German Ministry for Food and Agriculture, the margarine industry used, in 1932, over 97 per cent. of foreign raw materials, mainly vegetable oils and whale oil. In 1913, animal fats such as lard and suet, which could be produced at home, formed more than one-half of the raw materials used.³

Before the War, margarine represented 23 per cent. of the total supply of fat consumed in Germany and butter 52 per cent. In 1932, margarine represented 43 per cent. and butter 38 per cent. of the total. Before the War, the fats used by the German margarine industry consisted of 47 per cent. vegetable oils, and 53 per cent. animal fats. In 1932, vegetable oils accounted for 61 per cent. of the

¹ Blätter für Landwirtschaftliche Marktforschung, Jan.-Feb., 1933.

² *Id.*, April, 1933.

³ Zentralblatt des Deutschen Landwirtschaftsrats und der Preussischen Hauptlandwirtschaftskammer, Jan. 9, 1933.

THE GERMAN FAT MONOPOLY

materials used, fish oils for 35 per cent. and animal fats for 4 per cent.⁴

The increasing dependence on overseas sources for edible oils and fats has for some time given concern to the German Government. As long as unrestricted quantities of margarine made from imported materials could be obtained at low prices, the market for German butter—the milk producers' main manufacturing outlet—could not be improved. From the consumers' point of view, however, the unrestricted import of foreign oils and fats was, on the whole, welcome. Those who could afford to use butter doubtless continued to do so, but a large part of the population (including many small farmers who either made butter themselves or sold their milk to creameries) could only afford to consume margarine. The widespread unemployment in Germany emphasized this distinction between consumers of home-produced and foreign fats.

The milk market in Germany had been reorganized by an important law in 1930, under which the producers of fluid milk were united in associations, for ensuring the supply of milk to the principal markets and regulating its sale so as to avoid violent fluctuations in price. Quotas were assigned to the chief markets and, to this extent, the regulation of the fresh milk supply was satisfactory. Conditions of shortage and glut were avoided and prices were stabilized. These quotas did not, however, include all milk produced in Germany, and the marketing of the uncontrolled supplies was still as chaotic as it had been before the law was passed. Milk production was increasing and so was the competition of milk products from abroad. The over-supply of milk for the manufacturing market brought about disastrously low prices, and it became necessary for the Government to intervene on behalf of the milk producer.

Establishment of the New Policy.—The first step taken to improve the market for home-produced butter and other edible fats was the issue of a Presidential Decree on December 23, 1932, empowering the Government, *inter alia*, to prescribe the percentages of butter, tallow, lard, and other fats to be used in the manufacture of margarine in German factories, or to be mixed with imported margarine before it could be offered for sale. Since the quantity

⁴ Foreign Crops and Markets, July 31, 1933.

THE GERMAN FAT MONOPOLY

of butter to be mixed in margarine would be relatively small, it was not expected that the price of margarine would be increased. The Government's intention was to obtain a voluntary agreement on this subject with the margarine and oil-milling industries. Both Holland and Norway had enforced similar regulations, and there seemed no reason why Germany should not, by the same means, find a market for some of her home-produced butter and lard. Neither the public nor the manufacturers, however, took kindly to the policy and, after considerable discussion, it was allowed to drop.

The decree also empowered the Government to prescribe the extent of the production of margarine, artificial food fats, edible oil, vegetable oil and train oil, as well as to require the use of home-grown oil-seeds in oil mills. It was further provided that the Government might lay down conditions governing the production, treatment, composition, packing and marking of the products to be used or mixed with margarine, and might require these products to be obtained from certain sources.

Early in 1933, Germany underwent a complete change of Government and the policy of agricultural reconstruction became more drastic and comprehensive. The starting point was still the farm price of milk, but the problem was now envisaged as one of the fat supply in general. The first step taken was in continuation of the previous Government's policy. An Order was issued on February 24, 1933, requiring all oil-crushing mills in Germany after August 1 to use a certain proportion of home-grown oil seeds. The Ministers of Food and Economics were empowered to prescribe the percentages and the periods during which they would be applicable. This measure was intended to assist an important section of German agriculture which hitherto had received little direct help, but it was more significant as a step towards the control of the oil-milling industry.

About a month later, the foundation of the new policy was laid by a decree of the Reich President dated March 23. This measure was intended to promote the use of home-produced fats and feeding stuffs; and in order to secure the necessary control over the trade, it provided for the establishment of a Fat Monopoly on the lines of the existing Maize Monopoly.⁵ The Monopoly was given control of

⁵ See this JOURNAL, Vol. XXXIX, No. 2, May, 1932, pp. 159-160.

THE GERMAN FAT MONOPOLY

the supply of all raw materials used in the manufacture of margarine and over the production of margarine and other edible oils and fats. The Minister for Food and Agriculture was authorized to regulate the prices at which the Monopoly would purchase and sell oils and fats. The Government was also empowered to prescribe the kinds and qualities of margarine that might be produced commercially and the extent of their production and sale, to regulate prices and price margins, and to make compulsory the supply of certain kinds for the use of the necessitous classes of the population. Provision was made for the imposition of a "consumption tax" on margarine, artificial edible fats and oil, hardened vegetable fats and hardened fish oil. The proceeds of this tax which, at 25 pfennigs per lb., were estimated at R.M. 200 million per annum, were to be utilized for the provision of edible fats at low prices to the poorer classes, and for buying-up surplus stocks of butter. Provision was also made for the use of a certain proportion of home-produced tallow in the manufacture of soaps and candles, and the manufacture of margarine cheese was prohibited.

With certain exceptions, the powers provided in this and the previous Decree, as far as they relate to oils and fats, are enabling powers to come into effect as and when determined by the Government. The main Orders so far issued under the Decrees are as follows:—

On March 23 an Order issued by the Ministers of Agriculture and the Interior required manufacturers of margarine and artificial fats to reduce their output between March 27 and June 30, 1933, to 50 per cent. of the quantities produced by them during the last quarter of 1932. These Ministers were empowered to allow a production of 60 per cent. if they deemed it advisable; but they considered that they ought to keep in hand a margin of 10 per cent. to meet special cases where the general restriction would involve hardship, or where a higher level of output would be to the public advantage.

Free use has been made of this provision, especially in the small and medium factories. A condition which is attached to the privilege of extra production, is that an amount of skim milk equivalent to 15 per cent. of the total output of the factory must be used in the manufacture of margarine.

In order to ensure the execution of this Order manufacturers were placed under direct Government supervision and were required to make regular reports of their output and stocks, and to admit authorized Government inspectors to their premises at any time.

On April 4, 1933, two more Orders were made, with effect from April 12, setting up the Fat Monopoly and the administrative machinery for the regulation of the trade in imported oils and fats. Finally, on April 13, an Order was issued requiring proprietors of restaurants and similar establishments, as well as bakers and confectioners, to display notices indicating whether margarine, artificial edible fats, edible oils, vegetable fats or hardened fish oil have been

THE GERMAN FAT MONOPOLY

used in the manufacture of any products offered for sale on their premises. It was further provided that the percentage of each ingredient used in the preparation of edible oils and fats for retail sale should be clearly marked on the wrapper or container. This Order came into force on May 15, 1933.

The new control policy was explained by the Secretary of the Ministry for Food and Agriculture, Herr von Rohr, in a statement which he made to Press representatives on March 26, 1933.⁶ The Government, he said, had no desire to put unnecessary obstacles in the way of the German margarine industry, but they were determined to free Germany from dependence on foreign-produced fats. A levy would be imposed on all imported fats, and the proceeds would be used for subsidizing cheap "fat cards." These cards would be given to qualified persons—for example, to the unemployed. To prevent any abuses of the law the Government had set up a monopoly for all materials used in the manufacture of margarine. It was not intended to be a trading monopoly; its principal function was to control the supply of materials. It would impose only a small surcharge on home-produced supplies to cover expenses.

The Government hoped that the current production of margarine (515,000 tons a year) would be reduced by 100,000-150,000 tons, and that German butter and lard would take the place of the margarine thus removed from the market. Margarine would be available only to the regular users who could not be expected to buy butter and lard. Other people, who might just as well use the more expensive fats, were to be encouraged by means of propaganda to use butter. The public was not to be left in any doubt as to whether butter or margarine was being supplied.

Oil seeds and oil cakes were to be controlled by the Maize Monopoly, but this did not mean that the prices of these articles would be forced up. The Government's principal aim was to stabilize the prices of butter and edible fats and in so doing to steady the prices of milk, meat and cattle

The Policy in Operation.—Oils and fats produced in Germany or imported from abroad can only be brought into free circulation by the Fat Monopoly. Persons wishing to put such products on the market must offer them to the Fat Monopoly for purchase before they can be cleared in the open market. There is no obligation on the Monopoly to take over any products offered to it, and goods which it refuses to accept cannot be brought on to the German market. The importer must obtain a delivery warrant from the Monopoly and this must be produced at the Custom House when the goods are cleared. The delivery warrant is returned to the importer on payment of the difference between the price at which the Monopoly takes over the goods and the price at which it sells them. The Monopoly buys at the Hamburg price of the day when the offer is posted. Its selling price is made up of the buying price plus the prescribed surcharge. The surcharge acts as an additional import duty and is intended to represent the difference between German internal prices and the

⁶ Berliner Tageblatt, March 26, 1933.

THE GERMAN FAT MONOPOLY

world prices. The actual handling of the goods is left to the organized trade, working on the certificate system.

The surcharges to be levied on imports from March 1, 1934, are (per 100 kg.):—Butter, R.M.82; Cheese (not in packets of 2½ kg. or less, according to kind), R.M.10 to 24; soft skim milk cheese, 50 pf. (administrative charge only); other sorts of Cheese, R.M.21; Eggs, R.M.13.

The other part of the control policy that relates to the supply of edible fats for the poorer classes has undergone some modification.

The consumption tax on margarine and other edible fats (at the rate of 50 pfennigs per kilogramme) became effective on May 1, 1933. "Cheapening Cards" were issued for the first time a few days later. The holders of these cards were entitled to buy stated quantities of fats at greatly reduced prices, the difference between the official selling price and the market price of the day being made up from the proceeds of the "consumption tax."

This arrangement proved satisfactory up to a point, but the authorities soon found themselves pressed to extend the benefit to a much wider circle of consumers and to provide for a greater supply of cheap fats. When the output of margarine to be allowed during the third quarter came to be settled, the Government announced (June 21, 1933) that the existing rate of manufacture (50 per cent. of the basic figure) would continue, but that factories would have to produce low-grade margarine (i.e., that delivered to retailers at 32 to 50 marks per 50 kilogrammes) up to 30 per cent. of their total output. The low-grade margarine specially made under this regulation was to be called "*Konsumware*," and in order to prevent this cheap household fat getting into general circulation all containers were to be clearly labelled with this name.

The working of the Monopoly was reviewed just before the end of the period covered by this regulation, and an Order was issued on September 23, giving fresh instructions to margarine factories and oil mills. This Order, which cancels all previous measures dealing with the subject, provides that one-half of the production of all margarine factories is to be sold against cards as "Household margarine" (this product replaces *Konsumware*—in name, at any rate—in the retail shops). "Household Margarine" is to be delivered to retailers at 32 pfennigs per lb. (half-kilo.) and sold by them, to customers duly presenting the appropriate cards, at 38 pfennigs per lb. Margarine

THE GERMAN FAT MONOPOLY

factories are required to use a proportion, to be announced from time to time by the Minister for Food and Agriculture, of German neutral lard during certain periods of the year. As before, the total quarterly output of each factory—including "Household Margarine"—is restricted to 50 per cent. of its production during the basic period October 1 to December 31, 1932, the Minister being authorized to allow more in special instances.

The administrative arrangements for the supply of these subsidized foodstuffs have also been revised. "Fat Cards" comprise two sets of coupons. One set is used for the "cheapening of edible fats" and entitles the holder to buy a stated quantity of butter, cheese, lard, sausage, raw fat, bacon, tallow, edible oil, margarine, artificial edible fat or hardened vegetable or animal fats at 25 pfennigs a pound below the market price. These coupons are detached by the retailer at the time of purchase and are sent to the appropriate finance office within a month of the last day for which they are valid. At the base of the card is another set comprising six coupons and covering the purchase of 3 lb. of "Household Margarine" during the month. The card-holder has to submit the base of his fat card to the retailer about two weeks before the margarine is to be purchased. The retailer affixes his firm's stamp and detaches the order coupon from the base of the card. The coupons are then sent to the appropriate Finance office, which authorizes the issue of enough "Household Margarine" to cover the intended purchases and no more. Every effort is made to prevent this product from getting into illicit trade.

Recent Developments.—The scope of the policy has been considerably extended by a further series of enactments, and the import duties on oils and fats have been progressively increased. A law of December 20, 1933,⁷ provided for the application of the monopoly system to milk products, viz., butter, cheese, processed milks, cream, and casein. The administration of this law was entrusted to the Fat Monopoly which, thereupon, became the Reich Monopoly for Milk Products, Oils, and Fats. On the same date a monopoly organization on similar lines was established for eggs.⁷

A semi-official explanation⁸ of the Milk Products law

⁷ See this JOURNAL, Vol. XL, Vol. 12, March, 1934, pp. 1179-1182.

⁸ *Deutscher Reichsanzeiger*, December 22, 1933.

THE GERMAN FAT MONOPOLY

refers to the need for planning the market and stabilizing the prices of milk products in the interests of the German agricultural industry as a whole, and points out that this can only be secured by the regulation of *both* home-produced and imported supplies. It is also stated that, for political reasons, regulation of imported supplies cannot be undertaken in the absence of corresponding arrangements for the regulation of the home output.

The most recent development of importance is a Decree, dated February 18, 1934, which extends the scope of the Fat Monopoly to certain products of meat factories, lard refiners, neutral lard makers, tallow melters, etc. Bacon, lard, and beef and mutton fat are among the products covered by this Decree. There are, however, exemptions with respect to these products.

It is too early as yet to judge the effects of the policy as a whole, or to predict the changes which it is likely to bring about in German agriculture. As already stated, one of the main objectives has been to stabilize the market for milk products. Such information as is available suggests that this has, to a large extent, been achieved. The wholesale price of butter, for example, has remained practically unchanged, since last August, at R.M. 126 per 50 kg. According to semi-official commentators, this is directly attributable to the operation of the Fat Monopoly.

SOME IMPRESSIONS OF BRITISH FARMING*

V—WESTERN COUNTIES AND WALES.

J. A. SCOTT WATSON, M.A.,

*Sibthorpian Professor of Rural Economy, University of
Oxford.*

South Cheshire.—The farming of Cheshire is chiefly remarkable for its concentration upon dairying and for the very highly intensive character of this industry in the areas best suited to it. The county as a whole carries a stock of more than 26 cows (cows in-milk or in-calf, and heifers in-calf) to each 100 acres of its total agricultural area. In addition there are fully 12 young cattle per 100 acres, making in all a beast to about $2\frac{1}{2}$ acres of farm land on this basis. Both the figure for cows and that for total cattle are the highest for any county in England. The northern part of the county is not so highly specialized, for it has more arable, with considerable areas of market crops such as wheat and potatoes; but in the south—the belt that extends from around Crewe and Nantwich westwards to the Dee—the concentration of milch cattle is quite extraordinary. Thus T. J. Young† found that on ten selected well-farmed holdings the average stocking was 50 cows and 7 head of young heifers per 100 acres.

Cheshire's fame as a dairy county goes very far back, and there seems to have been a consistent effort for at least the last hundred years to maintain an ever-increasing output of milk. The value of bones as a manure for pasture was discovered very early, and a notable improvement in the quality of the pastures was effected as soon as adequate supplies became available. Again, a good deal of the land is naturally wet, and the large-scale drainage operations of the middle of last century must have meant a big increase in the carrying capacity. So too the increasing supplies of imported concentrated feeding stuffs were exploited by increasing the cow stock. The rise in numbers has continued right up to the present time, the total of cows having risen by 30 per cent. within the past generation. The actual

* Previous articles in this series were published in the issues for February, March, April and May this year. The concluding article will appear in the next (July) number.

† *Jour. R.A.S.E.*, Vol. 76 (1915), p. 105.

IMPRESSIONS OF BRITISH FARMING—V

numbers returned in the three years mentioned below were:-

1892	..	..	..	..	105,409
1912	..	..	..	..	114,902
1932	..	..	..	..	138,289

Meanwhile there has been some decline in calf-rearing, the cow-keepers having come to rely more and more on purchases from the breeding grounds in the more northerly counties and in Ireland. Measured, however, in terms of food requirements, the increase in the dairy herd as a whole must have been of the order of 25 per cent. in the 40 years.

It does not need to be stressed that the bulk of the grass land of the county is very highly productive. The average yield of meadow hay is exceeded by only one county—the Holland division of Lincolnshire. The typically deep and rather heavy soil is retentive of moisture and the rainfall of about 30 in. a year is adequate. The whole district is low-lying and sheltered, so that the grazing season is as long as in many districts farther south. Good general management, periodic dressings of phosphates and occasional applications of lime seem to be all that is required, along with the residues of purchased cakes, to maintain the pastures at somewhere near their maximum productivity.

The very heavy stocking of land with one type of animal generally brings its own difficulties, and although it can scarcely be said that the pastures of Cheshire are generally "cow sick," yet the problem of bovine disease is definitely more serious than in poorer and more lightly-stocked areas. The great Rinderpest outbreak of 1865-6 was specially disastrous to Cheshire and it will be remembered that here too, in 1923-24, Foot-and-Mouth Disease came as near as it ever has done to getting out of control. Again it will probably be found, when the wholesale eradication of Tuberculosis comes to be undertaken, that the obstacles will be greatest in thickly-stocked districts like Cheshire. The tendency to abandon calf-rearing may be partly the result of special difficulties in disease control, though the common answer is that the land is too good (and too dear) to carry young cattle.

Among the other problems that arise under Cheshire conditions is that of the economical disposal of dung. The county as a whole maintains about six cattle and two or three pigs for each acre of "green crop" (potatoes, roots,

IMPRESSIONS OF BRITISH FARMING—V

cabbage, etc.), that it grows, and in the purely dairying districts the disproportion must be much greater. Thus, when the needs of the root crops have been amply met, the farmer is left with a large balance of dung which he can only use by applying to his meadow or pasture ground. Investigations by the Cheshire School of Agriculture show that the actual return obtained from dung used on hay meadows is far below the price usually placed on it in farm valuations, and as regards pasture the position is probably much worse. To have more muck than one knows what to do with is one of the rarer problems in farming. As one might expect, the limit of profitable artificial manuring, on land that is so heavily fed through the live stock, is abnormally low. Even early potatoes, which in other districts respond to (and pay for) dressings of 3 or 4 cwt. of nitrogenous manure often reach their maximum yield, in Cheshire, with 1 cwt.

The Cotswolds and the Vale of Evesham.—There are few more interesting parts of rural England than that which makes the curious jumble of the corners of Oxfordshire, Warwickshire, Gloucester and Worcester.

If we keep to the uplands east of the Cotswold escarpment we are in a rather high and bare limestone country, cut up, however, with very pleasant little valleys and dotted with some of the most beautiful stone-built villages that England has to show. The land is of no great natural fertility—10s. an acre will rent a good deal of it—and is mainly in big farms that have largely gone down to grass. Hereabouts there is a considerable sprinkling of farmer immigrants, mostly from Northumberland, and many of these have transferred to their new homes what is, in many of its essentials, the Northumbrian system of farming, based almost entirely on meat production. Grass-seeds mixtures of the "Cockle Park" type, consisting mainly of perennial ryegrass, cocksfoot and wild white clover have produced excellent swards which, on all but the shallowest soils, are wearing well. The old Cotswold sheep have quite gone and have been replaced by the Halfbreds, Mules and Cheviots of the north, producing lambs to sires of the Down breeds. The cattle, largely Angus crosses and Herefords, are reared among the sheep, wintered very largely on hay and fattened on the richer pastures. An occasional hit is still made with wild white clover seed, though there are now

IMPRESSIONS OF BRITISH FARMING—V

no prodigious profits to be made in that business. Such farms have weathered the storm better than those that have been kept under continuous arable cultivation, and are in good heart to grow corn again now that arable farming seems to offer better prospects than meat production on grass.

Perhaps more interesting and certainly more revolutionary is a new system of grassland farming that is to be found most completely developed at Notgrove, near Northleach.* This is a combination of "Hosier" dairying, grass sheep farming and the folding system of poultry keeping. Here on a thousand acres of grass are three dairy units, or nearly 200 cows in all; some 500 or 600 breeding ewes; and a poultry department that now consists of nearly 7,000 head and is still in process of expansion. To handle all these classes of stock successfully makes obviously a very complex problem in management, but when it is skilfully done it seems to make possible a level of production that would be hard to attain by any other means. A field is used for the dairy or the dry cows, is sheeped or folded with poultry, hayed or cut for silage as seems best, and is dressed with basic slag when necessary. By ringing the changes in this way the sward is kept under very close control and the whole area, both old downland and sown grass, is steadily improving in quality.

Passing westwards one comes to the Cotswold edge and finds, spread out 400 ft. below, the orchards and market gardens of the famous Vale of Evesham. Fruit growing is a very old-established industry here, dating back, it is said, to the days of Henry III. The County Reporter, writing about 1800, says that market gardening was carried out on a considerable scale even then—he speaks of 300 acres of garden land in the vicinity of Evesham—and that the produce, such as asparagus and peas, had been carried on pack horses, before good roads were available, as far as Birmingham and Bath.

The cultivation at Evesham is very intensive and very mixed. Plum or apple orchards are often interplanted with gooseberries or currants, or sometimes with vegetables, wallflowers or bulbs. Raspberries, loganberries and strawberries are common crops. From the point of view of value

* For details see H. G. Robinson, "Notable Farming Enterprises," in *Jour. R.A.S.E.*, Vol. 93 (1932), p. 146.

IMPRESSIONS OF BRITISH FARMING—V

asparagus is the most important vegetable, but peas, French beans, and brussels sprouts occupy quite large acreages.

The spread of orcharding has been greatly helped by the "Evesham custom" of tenure, whereby the tenant retains the ownership of all permanent crops like fruit trees, and sells them, on his outgoing, to his successor. The tenant, in fact, is responsible for finding a successor in the farm.

Holdings vary greatly in size, from spare-time or part-time allotments up to capitalist farms employing quite large staffs. There is probably no other district in England where so many men have succeeded in climbing the agricultural ladder, starting as labourers and ending as substantial tenants. A worker may begin by leasing a half-acre allotment, which he plants up with asparagus and tends in his spare time until the beds come into bearing. He then has the nucleus of a holding and the assurance of a certain income so that he may take up more land, start the necessarily more speculative business of producing annual vegetables or fruit, and give up working for a master.

It seems doubtful whether the natural advantages of Evesham, for garden culture, are really as great as was formerly supposed. The history of the newer areas, like Wisbech, suggests that there may be still others, now under ordinary farming, that would be quite as valuable. However that may be, nearly all the better land round Evesham has already been taken up, and on the outskirts of the district small-holders are to be seen struggling with soils that are clearly unsuitable. These men would ultimately do far better if they could get away to new areas, only there they would not find employment, at their own trade, during the years needed to build up a full-time holding.

Welsh Mountain Sheep Farming.—Mountain farming differs essentially from all other types of British agriculture in the fact that the custom is to put nothing back into the land. No fertilizers are used, and the feeding of purchased concentrates or hay is quite exceptional. It is true, of course, that the drain on the fertility of the land is not a large one, and the traditional system rests on the assumption that the phosphate, lime and potash that are removed in the sheep and wool sold are replaced by supplies set free in the natural process of rock weathering. Generations of experience have taught the mountain farmer the natural

IMPRESSIONS OF BRITISH FARMING—V

carrying-capacity of each area of land under the old system, but lately many of the conditions have changed, and there is good reason to believe that the mountain pastures are now slowly but surely deteriorating.

One factor has been the increasing specialization throughout Wales, in sheep. In the old days a limit was often set to the flock by the amount of lowland or valley pasture available for wintering. The last forty years, however, have seen a decline of nearly 50 per cent. in the corn area, with a corresponding increase in low-ground grass, so that more sheep can be made available for the summer grazing of the mountains. Another factor has been the virtually complete disappearance of wether flocks and their replacement by breeding ewes—the causes being, of course, the decline in wool values and the growing preference, on the part of the consumer, for young meat. The yearling or two-year-old wether removed negligible amounts of manurial elements from the land, whereas the annual production of a lamb constitutes a very considerable drain. The increase in the total Welsh flock, and the change-over from wethers to breeding ewes, during the past 39 years, are shown by the following statistics:—

	<i>Thousands.</i>		<i>Change per cent.</i>
	1893.	1932.	
Breeding ewes	1,138	1,893	+ 66
Lambs	1,026	1,634	+ 59
Other sheep over 1 year ..	937	582	- 38
Total sheep	<u>3,102</u>	<u>4,111</u>	<u>+ 32</u>

It would clearly be useless to suggest a return to the old level of stocking, and the only alternative solution is to improve the mountain pastures. Hence the efforts now being made in this direction by Professor Stapledon and his colleagues are of great significance. Manuring alone, even of selected areas of the grazings, has failed to give very satisfactory results. In many instances the more desirable herbage plants are absent from the sward, bent, wiregrass and *Molinia* having complete possession. The scheme of improvement starts with burning over the more promising areas, which are then broken up. The most satisfactory results appear to be obtained with a specially strong two-furrow plough, drawn by a caterpillar-type tractor. The necessary manures are then applied, a tilth is prepared and

IMPRESSIONS OF BRITISH FARMING--V

a mixture is sown consisting of the best species that are likely permanently to survive. Yorkshire fog is the chief grass species used, but indigenous perennial ryegrass, rough-stalked meadow-grass and dogtail are also included. Wild white clover is, of course, of prime importance, and Late-flowering (Montgomery) Red Clover or Wild Red, or both, may be added.* In general the results are highly promising, and are at least sufficient to justify similar experiments in our other mountain areas, where the same kind of problem undoubtedly exists.

* For details see this JOURNAL, April, 1932, page 36.

THE FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

E. A. FISHER, M.A., D.Sc., F.I.C.,
The Research Association of British Flour-Millers,
St. Albans,
and THOMAS SHAW, M.C., N.D.A.,
The Millers' Mutual Association.

IN the Fertilizers and Feeding Stuffs Act, 1926, wheat offals or milling offals are defined as "A product of wheat separated in the process of milling and containing not more than 4 per cent. of vegetable substances, other than wheat, extracted from wheat in the process of cleaning by the maker of the offals in the production of flour."

Although "wheat offals" or "milling offals" thus appears to be the official name for the residual material made in the milling of wheat after the extraction of the flour, the term "wheatfeed" has come into general use in the milling industry for this material, and has been substituted authoritatively by the Trade in place of the undesirable and inaccurate term offal. Wheat is milled into two main products—flour and wheatfeed; wheatfeed, although a residual product, requiring the same consideration as if it were equally a main product.

Precise knowledge concerning the feeding value of the various kinds of wheatfeed can be obtained only on the basis of complete chemical analyses of the feed, and by feeding trials. Nevertheless, it has been long recognized that a fair idea of the relative feeding value of the various grades of wheatfeed is given by a knowledge of the content of crude fibre or indigestible material, provided the wheatfeed is pure or unadulterated. Hence, the Fertilizers and Feeding Stuffs Regulations of 1926 placed a limit to the amount of other vegetable matter (screenings) and of insoluble and silicious matter (sand and dirt) that may be added to wheatfeed and prescribed that the fibre content of all wheatfeed offered for sale should be declared.

It should be emphasized that the fibre is not a chemical substance of definite composition. It is the undissolved material left when the feeding stuff originally containing it has been treated in the prescribed manner with solutions of acid and of alkali. It may be said to correspond approxi-

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

mately with that portion of the feeding stuff that is not digested by the animal and consequently passes into the faeces. It is in fact the "roughage" part of the food.

Until comparatively recently, it was not easy to assign an average chemical composition or an average fibre content to the various grades of wheatfeed. Sharps or middlings (sold under a great variety of local names) from different parts of the country varied widely in fibre content and in size of particle. This variation was due partly to variations in actual milling practice, and partly to the fact that some mills made as many as four grades of wheatfeed and some only two.

Broadly, flour will pass through a No. 10 silk (113 meshes per inch); wheatfeed will not. Bran will overtail a No. 16 wire sieve (= 16 meshes per inch). This separation is almost universal, but great variations occur in the methods of separating the products intermediate between flour and bran.

Investigations by Wood and Adie, 1916.—The problem was investigated by the late Professor T. B. Wood and R. H. Adie* in 1916. They examined 36 samples of wheatfeed from various parts of the country and submitted them to chemical and to sifting analysis. Apparently, there were six grades of wheatfeed (other than bran) on the market at that time: three "pure" grades and three mixed grades.

Grade 1.—Fine middlings: would not pass a No. 10 silk but would pass a No. 3 silk (or 56 wire = 56 meshes per inch).

Grade 2.—Coarse middlings: would not pass a No. 3 silk but would pass a No. 24 wire sieve.

Grade 3.—Pollards: would not pass a No. 24 wire but would pass a No. 16 wire.

Grades 1, 2 and 3 mixed, i.e., Straight-run middlings: the whole intermediate product between flour and bran: would not pass a No. 10 silk but would pass a No. 16 wire.

Grades 1 and 2 mixed: would not pass a No. 10 silk but would pass a No. 24 wire.

Grades 2 and 3 mixed: would not pass a No. 3 silk but would pass a No. 16 wire.

These grades varied in average fibre content as follows:—

Grade 1—fine middlings	..	..	1.86	per cent. fibre
" 2—coarse middlings	..	..	5.29	" "
" 3—pollards	..	..	7.70	" "
Bran	..	..	10.58	" "
Mixed 1 and 2 grades	..	..	3.94	" "
" 2 and 3 "	..	..	6.17	" "
" 1, 2 and 3 (straight-run middlings)	..	..	4.52	" "

* This JOURNAL, Vol. 23 (1916-17), pp. 1179-87.

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

This work was done before the first war-time Milling Order and represents the state of affairs concerning normal pre-war offals. War-time control resulted in definite modifications in grading and naming offals, effects which persisted after the War. As will be seen, an important effect was the virtual disappearance from the market of home-milled pollards.

Investigations by Woodman, 1923.—The problem was re-investigated in 1923 by H. E. Woodman* who examined, along lines similar to those of Wood and Adie, 83 samples of wheatfeed, of which 45 were brans, from 31 mills. Of the 38 samples other than bran, 30 could be described as coarse middlings of average fibre content 6.28 per cent., 3 as fine middlings of average fibre content 2.48 per cent.: and the remaining 5 were anomalous, their average fibre content, 9.23 per cent., being higher than that of the pre-war pollards (7.70 per cent.) and less than Woodman's figures for bran (10.9 per cent.). They could perhaps be regarded as overflows obtained during the manufacture of the other grades.

Woodman's final conclusion was that, at that time (1923), wheatfeed fell into three grades:—

Bran, average fibre content	10.90 per cent.
Middlings, average fibre content	6.28 ..
Fine middlings, average fibre content ..	2.48 ..

Investigation by the Research Association of British Flour-Millers, 1927.—In 1927, after the passing of the new Fertilizers and Feeding Stuffs Act of 1926, the problem of the fibre content of wheatfeed was reopened by the Research Association of British Flour-Millers in collaboration with the National Association of British and Irish Millers.

Thirty-six representative firms, manufacturing offals in all quarters of Great Britain, sent to the laboratories typical samples of all the grades of wheatfeed they were making. Altogether, 105 samples were received under the following designations:—

Broad bran	18 samples
Bran	38 ..
Sharps	14 ..
Middlings	10 ..
Thirds	11 ..

* *Jour. Agric. Sci.*, Vol. 13 (1923), pp. 483-507.

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

Toppings	..	..	..	..	2	samples
Parings	..	..	..	..	2	"
Coarse parings	..	..	..	..	1	sample
Seconds	..	..	..	..	2	samples
Fine offal	..	..	..	..	2	"
Coarse offal	..	..	..	..	1	sample
Boxings	..	..	..	..	1	"
Supers	..	..	..	..	1	"
Flake	..	..	..	..	1	"
Blews	..	..	..	..	1	"

All were analysed for fibre, but no sifting analysis was carried out. The fibre contents were determined by means of the new official method described in Fertilizers and Feeding Stuffs Regulations, 1927, and were, in all cases, re-calculated to a 15 per cent. moisture basis. This method differs in certain respects from the earlier one and may account for some, but not for all, of the differences observed between the results given below and those of the earlier workers. In spite of the great variety of designations, the samples grouped themselves very definitely as regards fibre content into three fairly sharply distinguished classes that may be called bran, coarse middlings and fine middlings.

The figures for the 18 samples of broad bran varied from 7.9 per cent. to 9.9 per cent. of fibre; those for 38 samples, labelled bran without the adjective, varied, with one exception, from 7.7 to 10.3 per cent. *This means, as far as fibre content is concerned, that there is no difference between bran and broad bran.*

When all the bran figures as to fibre content* were arranged in order of magnitude, all, except one, were closely crowded between 7.7 and 10.3 per cent., with no appreciable gaps anywhere. That is to say, fibre figures for brans seem to stop sharply at, say, $7\frac{1}{2}$ per cent., which suggests that this figure is the lowest likely to occur in, say, 98 per cent. of the samples.* It appears, therefore, that wheatfeed of higher fibre content than $7\frac{1}{2}$ per cent. should be regarded as bran.

All the bran figures fell on a symmetrical frequency curve† with a clearly defined mode† at 8.8 per cent., the mean figure being 8.9 per cent.

* Only 1 of the 56 samples gave a lower value than $7\frac{1}{2}$ per cent., viz., 6.92 per cent.

† It is not necessary to explain here the full meaning and significance of frequency curves and modes. It is sufficient to say that when results fall on a symmetrical frequency curve and the mode is close to the mean or average value, it follows that the results are sufficient in number for the mean to be accepted as accurate, reliable and thoroughly representative. In other words, a similar average value would have been obtained if double the number of brans had been analysed.

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

This figure, 8.9 per cent., is markedly below those obtained by Wood and Adie (10.6 per cent.) and Woodman (10.9 per cent.). In fact, the *highest* figure found by us for bran, viz., 10.3 per cent., is below the average figures of the earlier workers. This striking fall in the fibre-content of bran is a real fall, and is not due to changes in the official method of estimating fibre. In pre-war and early post-war years the annual output of bran probably did not exceed 25 per cent. of the total wheatfeed production; now it is nearer 40 per cent.. In other words, modern home-milled bran contains material which formerly went into the middlings; it is therefore an improved product, of higher digestibility and lower fibre content.

Of the 49 samples other than bran, 37 gave results for fibre content that were closely crowded between $7\frac{1}{2}$ and $4\frac{1}{2}$ per cent. The mean value (for these 37) was 6.0 per cent.; the results again fell on a symmetrical frequency curve with a mode at 5.85 per cent., thus indicating that the mean value was sufficiently accurate and reliable and truly representative.

Six samples formed a separate group with fibre content below $4\frac{1}{2}$ per cent., ranging from 4.2 to 2.4 per cent.—mean value 3.1 per cent.

Another six had fibre contents above $7\frac{1}{2}$ per cent., ranging from 7.5 to 8.7 per cent. (mean value 8.0 per cent.). These are perhaps survivors of the pre-war class of pollards, but, judged from their fibre content, should undoubtedly now be regarded as brans.

These results indicated that according to fibre content (which may be regarded as a sufficient indication of feeding value as between buyer and seller) all home-milled wheatfeeds fall into three sharply defined classes:—

	<i>Fibre content, per cent.</i>	<i>Mean value, per cent.</i>
Bran	7.5 to 10.5	8.9 or, say, 9.0
Coarse middlings ..	4.5 to 7.5	6.0
Fine middlings below	4.5	say 3.0

Whatever commercial value the goodwill attached to local names of wheatfeeds may have, such names have no significance as regards fibre content or feeding value. This is indicated plainly by the figures obtained. Thus:—

Sharps.—Of 14 samples (so labelled) received, one, according to fibre content, was undoubtedly a bran. The remaining 13 ranged in fibre content from 4.7 to 7.35 per cent.—mean value 6.2 per cent.

Middlings.—Of 10 samples received, one was a bran and one a

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

fine middlings. The remaining 8 ranged in fibre content from 4.6 to 6.95 per cent.—mean value 6.2 per cent.

Thirds.—Of 11 samples received, one was a bran and two were fine middlings. The remaining 8 ranged in fibre content from 4.7 to 6.2 per cent.—mean value 5.4 per cent.

Investigations in 1930-32.—It will be observed that Woodman's (1923) figure of 6.3 per cent. for the fibre content of coarse middlings is very close to the Research Association's (1927) figure of 6.0 per cent. To ascertain whether the composition of wheatfeed showed any tendency towards stabilization, the Research Association's records were examined. During the period, July, 1930, to July, 1932, 52 coarse middlings were received for the routine determination of fibre content. The figures ranged from 4.5 per cent. to 7.5 per cent., the mean being 6.0 per cent.—precisely the same as was found with the earlier samples. *It is evident that, taking the country as a whole, no change in the composition of coarse middlings has taken place in the past five or six years.* In other words, the composition of middlings has been stabilized. Wheatfeed is to be regarded as a standard feeding stuff of remarkably constant average composition, and is in no sense a mere by-product of widely fluctuating fibre content.

However, recent changes within the milling industry led the Millers' Mutual Association to raise again the whole question of the composition of home-milled wheatfeed, with particular reference to fine wheatfeed, i.e., the various grades of middlings. There was reason to believe that such changes had resulted in the manufacture of a greatly improved product, as has been the case with bran, and the results of practical feeding trials—notably those conducted at Wye, and of many large-scale practical tests during 1931 and 1932—tended to confirm this belief.

Two other very important factors, however, contributed to the need for a fuller and further investigation. In the first place, all work on this subject to date had been conducted on samples of fine wheatfeed drawn from mills in various parts of the country, but without regard to the varying outputs of the products from those mills. It becomes essential, in order to obtain the average fibre content of the various ranges of fine wheatfeed for the whole country, to know, with regard to each sample, the exact output that it represents. Only in this way can the final analyses obtained for the respective samples used in an investigation be interpreted with any real significance. In

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

other words, the average fibre figure that is really significant must be based on output and not on number of samples analysed; i.e., the *weighted* average must be obtained.

In the second place, there has been during recent years an evident growth in the practice among millers to make a *straight-run middlings*, a grade that was not available in bulk at the time of Woodman's investigation. Various estimates had been given as to the percentage that straight-run middlings constituted of the total output of fine wheatfeed from English mills, and it was felt to be important that definite information should be obtained in this connexion.

Investigation in 1933.—In view of the above factors, a new investigation, confined to fine wheatfeed, was conducted in 1933. Samples for this purpose were taken from all port mills in England and Wales, and from a wide selection representative of country mills whose output of fine wheatfeed was guaranteed to be a straight-run product. The output from each of these mills was known, and it is significant that the combined outputs of straight-run middlings represented 80 per cent. of the total output of home-milled fine wheatfeed from those mills.

The fibre figures obtained in this investigation ranged from 3.8 to 6.7 per cent., the whole having an average fibre content, based on output, of 5.1 per cent. Only three of all the samples of this product examined contained above 6 per cent. of fibre, and these represented an insignificant output as compared with the whole. There was, further, no significant difference between the fibre figures of straight-run fine wheatfeed obtained from port and country mills respectively.

The fibre figures given by Woodman for fine and coarse middlings, respectively, were 2.3 per cent. and 6.5 per cent. It has been generally assumed that the coarse middlings, with the $6\frac{1}{2}$ —7 per cent. fibre content, represented the bulk of the output, and standard feeding tables have for some time based food comparisons on this assumption. The following percentage classification, based on the investigation now completed, approximately represents the present position with regard to this product:—

<i>Percentage of the Total of Wheatfeed manufactured.</i>				
				<i>per cent.</i>
Bran	..	..	..	40
Fine middlings	..	..	..	5
Straight-run middlings	..			45 (= 75 per cent. of total fine wheatfeed.)
Coarse middlings	..	..		10

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

The results of this investigation reveal, therefore, an entirely new situation with regard to wheatfeed, and it may be summarized at this point as follows:—

Recent developments within the milling industry have increased bran production from about 25 per cent. to approximately 40 per cent. of the total output of wheatfeed. The feeding value of the bran has increased, since the average fibre content has fallen by approximately 2 per cent.

The composition of coarse middlings has remained substantially constant for the past five or six years. Wheatfeed may now be regarded as a standard feeding stuff of definite composition, and not as a variable by-product.

Coarse middlings has now been largely replaced by straight-run middlings, the latter now representing some 75 per cent. of the total middlings. This completely reverses the situation that prevailed in early post-war years when the bulk of the middlings on the market were coarse. It is true to say that the fibre content of the *predominant grade* of middlings on the market has fallen from 6.5 per cent. (the figure given in the Ministry's *Rations for Live Stock*, Bulletin No. 48) to approximately 5.0 per cent. It becomes necessary, therefore, to review the position in the light of the figures now available.

In *Rations for Live Stock*, the following are the digestible ingredients and fibre of the three grades of middlings and of barley meal:—

	<i>Digestible Ingredients</i>			<i>Other Ingredients</i>			
	<i>Protein</i>	<i>Oil</i>	<i>Starch</i>	<i>P₂O₅</i>	<i>CaO</i>	<i>Fibre</i>	<i>Manurial</i>
	<i>per</i>	<i>per</i>	<i>Equiv.</i>	<i>per</i>	<i>per</i>	<i>per</i>	<i>Value*</i>
	<i>cent</i>	<i>cent</i>	<i>per</i>	<i>cent.</i>	<i>cent.</i>	<i>cent.</i>	<i>s. d.</i>
Fine middlings ..	12.6	3.7	69	1.4	0.05	2.3	12 0
Straight-run middlings ..	12.8	4.0	66	Not given.		4.5	12 0
Ordinary or coarse middlings ..	11.5	3.9	56	2.6	0.10	6.5	12 0
Barley meal ..	6.5	1.2	71	0.8	0.05	4.5	7 0

Straight-run middlings now represent the vast bulk of this product from English mills.

Practical Considerations.—From this substantial change in the type of middlings now marketed one may well inquire how far advantage may be taken of it in practical feeding methods. In the past, authorities have generally regarded

* These figures have been extracted from figures given periodically in this JOURNAL.

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

the high fibre content of the average run of middlings as a bar to its incorporation into pig fattening rations in greater quantities than 25 or 30 per cent.

The effective lowering of the fibre content, that has now been brought about, would seem to remove the only objection that there was to a liberal use of this product, and an examination of the present position may serve a useful practical purpose.

From the analyses given above, it will be noted that straight-run middlings, though lower in starch equivalent than barley meal, has twice the protein content of barley meal and a richer mineral content, while it is a balanced fattening food, having the same nutritive ratio as that of the feeding mixtures generally recommended.

The soundness, or otherwise, of incorporating substantial proportions of straight-run middlings into pig rations will depend not only on the improved composition of the product but also on its relative cost.

In this connexion, an examination of the market and unit prices, as they have prevailed for barley meal and middlings during the first nine months of 1933, reveals that their respective prices have been an average of £5 11s. 0d. per ton for middlings and £6 11s. 6d. per ton for barley meal. In so far as the price per unit of starch equivalent is concerned (based on the London prices) barley meal has maintained an average of 1s. 11d. per unit and middlings 1s. 8d. per unit for the same period. This short survey is very representative of the state of affairs that had prevailed in the feeding-stuffs market for the past ten years. Generally speaking, barley meal commands from 20s. to 30s. per ton more than middlings, and the unit price paid for it is 2d. or 3d. more than that paid for middlings.

Middlings, with its 6½ to 7 per cent. fibre content, has now been almost entirely replaced by straight-run middlings bearing a very different composition, and it would now seem that there can be no practical basis by way of justifying market conditions as they prevail with regard to these two foods.

An examination of two sets of rations will serve to emphasize the significance of this matter:—

Ration A.

65	per cent.	barley meal.
25	„	middlings (coarse).
10	„	fish meal.

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

This ration represents a typical fattening ration, originally formulated by Crowther at a time when the fibre content of the average middlings was held to be in the region of 6½ to 7 per cent. This is also the ration that has been adopted by the Pig Marketing Board to serve as the basis for estimating feeding costs.

Ration B.

45	per cent.	barley meal.
50	„	straight-run middlings.
5	„	fish meal.

The average market prices during the last nine months of the ingredients of these rations are as follows:—

Barley meal	..	..	..	£6	11	6
Middlings	..	..	..	£5	11	0
Fish meal	..	..	..	£16	0	0

On this basis, Ration A costs £7 5s. 0d. per ton, whilst containing 11.9 per cent. of digestible protein and 68.55 per cent. starch equivalent.

Ration B costs £6 10s. 6d. per ton and contains 12.05 per cent. protein equivalent and 67.85 per cent. starch equivalent.

From the scientific point of view, the analyses of these two rations are as nearly identical as they could be in protein content, fibre content and starch equivalent.

It should be noted that the inclusion of 50 per cent. straight-run middlings has made it possible to effect substantial economy in the use of fish meal, thus cheapening the ration to some extent, although the greatest saving in cost has been due to the free use of middlings, which is consistently cheaper, per ton, on its quotations, than barley meal.

Before leaving the price question, a further comparison in the cost of the two rations under discussion is informative. In the event of Ration B being sold at the same price as Ration A, the middlings content would be realizing £7 0s. 0d. per ton, and this figure might be held to represent the true value of straight-run middlings as compared with barley meal, when barley meal is at £6 11s. 6d. per ton. There is, however, another important factor to be taken into consideration—the difference of 5s. in manurial value between the two foods, which would make the actual value of straight-run middlings £7 5s. 0d. per ton when barley meal is at £6 11s. 6d. It would seem, therefore, basing all calculations on a strictly scientific basis, and disregarding

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

those practical factors that would always favour middlings, that there is no justification for the higher ruling price that prevails for barley meal, the true position being that straight-run middlings from the feeding point of view is worth somewhere in the region of 15s. per ton more than barley meal. This is an exact reversal of the positions that these two foods have hitherto held.

The Significance of the Price per Unit Starch Equivalent Figures—It has been seen that the price per unit of starch equivalent of barley meal and middlings, as published in the weekly *Agricultural Market Report* of the Ministry, has been for the first nine months of 1933 in favour of middlings. There are times, however, when these figures are given as equal, and very occasionally appear to favour barley meal.

When barley meal is at £7 10s. per ton and middlings at £6 10s. per ton, they are both represented as costing 2s. per unit of starch equivalent, the implication being that at these prices they are of equal value. It has already been shown that, from both scientific and practical points of view, straight-run middlings are worth to the feeder something more than barley meal. It follows, therefore, that any estimate of food evaluation that invalidates the findings of both science and practice is inaccurate, and that, as far as the two foods under consideration are concerned, it cannot be made to apply.

This may be amplified with advantage by the use of the figures published monthly in this JOURNAL, which show that, for the first nine months of 1933, the cost per unit of starch and protein equivalents have been, respectively, 1.3s. and 1.87s. Applying these figures to barley meal and straight-run middlings, the former has a nutritive content worth only £5 16s. 9d. per ton, whereas the latter is worth £6 5s. 3d. per ton. The following table sets out the financial comparison of the respective foods:—

	Value based on the cost per unit of protein and starch equivalent			Manurial value in excess of barley meal			Total Calculable values		
	£	s.	d.	£	s.	d.	£	s.	d.
Fine middlings ..	6	5	6	0	5	0	6	10	6
Straight-run middlings .	6	5	3	0	5	0	6	10	3
Ordinary or coarse middlings ..	5	4	3	0	5	0	5	9	3
Barley meal ..	5	16	9	—			5	16	9

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

The objection to the starch equivalent method of food evaluation, as it applies to these two feeding-stuffs, is that it takes no account of the fact that middlings contains twice as much digestible protein as barley meal, and any comparison that ignores this factor is inadequate scientifically and misleading in practice. There is as much difference between the protein content of middlings and bean meal as there is between that of middlings and barley meal, and if it were reasonable to make comparison of middlings and barley meal on a starch equivalent basis only, it would be equally reasonable to make the same comparison as between middlings and bean meal, and, therefore, to make them as between barley meal and bean meal, as being in the same group of feeding stuffs. Such is, of course, very far from being true.

Further emphasis is given to this matter in a Departmental Committee's Report,* which gives the nutrient ratio of middlings as 1 : 5, that of barley meal as 1 : 10 and that of bean meal as 1 : 2. It is obvious, from these ratios, that middlings and barley meal cannot, with any degree of accuracy be compared by the unit price method. The true position of middlings appears to be in between protein foods of the nature of bean meal and essentially carbohydrate foods such as barley and maize meals. To take no account of its protein content in estimating its relative value as compared with other foods, is, from the practical point of view, to ignore the possibilities of effecting very real and substantial economy in the feeding; and, from the scientific point of view, the above data are sufficient to invalidate the accuracy of any such comparisons.

Summary.—1. The figures at present in general use for the fibre content of the various ranges of fine wheatfeed are shown to be inaccurate and much too high. Changes in the manufacture and marketing of these products are the main factors accounting for this. Recent investigations conducted by the Research Association of British Flour-Millers, have revealed that straight-run middlings constitutes nearly 80 per cent. of the total output of fine wheatfeed, the remaining 20 per cent consisting of fine middlings and coarse middlings.

2. That average fibre contents of the respective grades are as follows:—

* Departmental Committee on " Rationing of Dairy Cows," Appendix 17.

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

	<i>Range, per cent.</i>	<i>Average, per cent.</i>
Bran	7.5 to 10.5	9
Coarse middlings	4.5 to 7.5	6
Straight-run middlings ..	3.5 to 6.7	5.1
Fine middlings less than	4.5	3

3. The present standard feeding tables, in assigning to middlings an average fibre content of from 6.5 to 7 per cent., are inaccurate. The average for the bulk of the output is very appreciably less, viz., not more than 5.1 per cent.

4. That as between straight-middlings and barley meal, chemical analysis reveals nothing that would justify the farmer paying more for the latter than the former. The high protein content, mineral matter and vitamin-content of straight-run middlings, together with its low fibre content, enhance its value, investing it with greater feeding value than that of barley meal.

5. That the unit price theory, based solely on starch equivalent, is inaccurate both scientifically and practically as a means of comparing middlings with barley meal.

It should be noted that no account has been taken in any of the above calculations of the special feeding properties appertaining to middlings of all descriptions, properties not capable of representation in any analytical figures, but recognized by both scientific workers and practical farmers, and conferring on middlings the factor of safety in feeding.

Future Grading of Fine Wheatfeed.—The substantial improvement in quality that has been effected during the past few years in the finer by-products of wheat has made it possible to effect a reorganization scheme within the milling industry, whereby these products will in future be sold in well-defined grades under guarantees of adequate protection to both farmer and miller.

The two criticisms usually levelled against these products in the past have been (1) that they were known by a multiplicity of names that were confusing and misleading, e.g., middlings, sharps, thirds, parings, boxings, toppings, seconds, etc., and (2) that there was a wide range of variation in the quality of the product from district to district and from season to season. The reorganization scheme disposes of the first of these difficulties completely, and, in great measure, narrows the range of variation in quality.

In future the great bulk of the output of middlings,

FIBRE CONTENT OF BRITISH-MILLED WHEATFEED

sharps, thirds, etc., where manufactured in the flour mills of England and Wales, will be marketed in two grades:—

Weatings, which is straight-run middlings.

Superfine Weatings, which is fine middlings.

The former will be sold with a fibre content guaranteed not to exceed 5.75 per cent., and the latter with a fibre content guaranteed not to exceed 4.5 per cent.

Weatings is a registered Trade Mark owned by the milling industry, and products sold bearing it will carry guarantees of quality that protect the feeder from the use of inferior products that do not conform to the standards of the mark.

It will be noted that, both as regards Weatings and Superfine Weatings, the guaranteed maximum fibre content is above the actual average as revealed by recent investigations. Educational authorities had frequently urged that should be much greater uniformity in the quality of these products and that an improvement in feeding value should be effected by a lowering of the average fibre contents. These two points have been met under the Weatings Scheme, and in future there will be available from all those mills, able to conform to the standards, products that will be greatly superior to those that have been available in the past.

THE MOSAIC DISEASE OF SUGAR-BEET AND RELATED PLANTS

KENNETH M. SMITH, Ph.D., D.Sc.,
*Potato Virus Research Station, School of Agriculture,
Cambridge.*

THE various Mosaic diseases of plants constitute a considerable part of what are known to-day as virus diseases; and a virus disease may be defined as one due to the disorganization of the living cells of the host by an agent that is usually below the limit of microscopical visibility. In the process of its attack on the host, this agent, or virus, as it is called, itself becomes regenerated or multiplied. There are many diseases due to viruses and they occur not only in plants but in animals, including man, insects, fishes and birds.

Of the virus diseases affecting agricultural crops, those attacking the potato have perhaps received most attention. This is chiefly because of their number, their almost universal occurrence, and the great reduction in yield in potato crops caused by them. There are, however, virus diseases of other plants of agricultural importance, and one such, which affects sugar-beet and related plants, is the subject of this article.

Mosaic of beet is thought to have been first described by two French scientists in 1898 under the name of "jaunisse" or "jaundice," and it was recorded for the first time in Germany, in 1926, by Molz, from Saale in Saxony. The disease is now prevalent over most of Europe and the United States of America, and probably occurs wherever sugar-beet or mangolds are grown.

Investigations upon Beet Mosaic have been carried out in foreign countries, notably by Böning^{1*} in Germany, by Mouravieff and Novinenko⁴ in Russia, and by Robbins,⁵ Jones³ and Hoggan² in America. No investigation of the disease and its methods of spread has been made, heretofore, in this country, and the moment seems opportune for publishing the following account of it, based partly upon results obtained by other workers but mainly upon original work carried out by the writer at Cambridge.

* For references, see page 274.

Mosaic Disease of Sugar-Beet

Symptoms of Mosaic in Sugar-beet, Mangolds and Allied Plants.—The first signs or *primary symptoms* of the disease in sugar-beet may be of two kinds. In one, the veins of the young central heart-leaves become picked out in yellow, a condition usually known as "clearing of the veins" and a common first symptom in several Mosaic diseases (Fig. 1). The other and more frequently-occurring type of primary symptom is the development on one or more of the heart-leaves of numerous small yellow spots, or irregular flecks, which increase in size. There may be a slight puckering of the leaf surface in the region of the spots. The next phase is the development on the young leaves of a bright mottling of very pale green or yellow against the darker green of the leaf. There may also be indentations of the leaf surface (Fig. 2). The older green leaves exhibit a fine speck-like mottling of pale green on a darker background. Characteristic features are the bending back of the leaf near the tip, and curling and crinkling of the leaf margin and tip, frequently followed by death of the tip.

In a more severe form of the disease, the leaves are curled and distorted, and the edges of the younger leaves often roll inwards, giving a tubular effect (Fig. 3). The mottling, also, is brighter. Growth is retarded and the plant may be stunted and deformed.

So far there is no evidence that more than one virus is concerned in the production of Beet Mosaic, and it is quite probable that the slightly different symptom-expressions exhibited are due to the same agent. The virus of this Mosaic is transmissible to all varieties of the beet (*Beta vulgaris*) and the writer has infected experimentally spinach beet, seakale beet, red or garden beet and mangold. In addition, spinach is susceptible to infection with this virus.

The symptoms of the disease in the mangold are very similar to those in the sugar-beet. The first sign of infection is "clearing of the veins" of the young leaves or, alternatively, the appearance of numbers of small light green flecks. These symptoms are followed by the development of the characteristic mottling of the leaves. Similarly with the garden beet, except that at first the symptoms may appear somewhat accentuated by contrast with the red background of the leaf.

On spinach, the virus produces a severe disease and the leaves, owing to their more delicate nature, are subject to

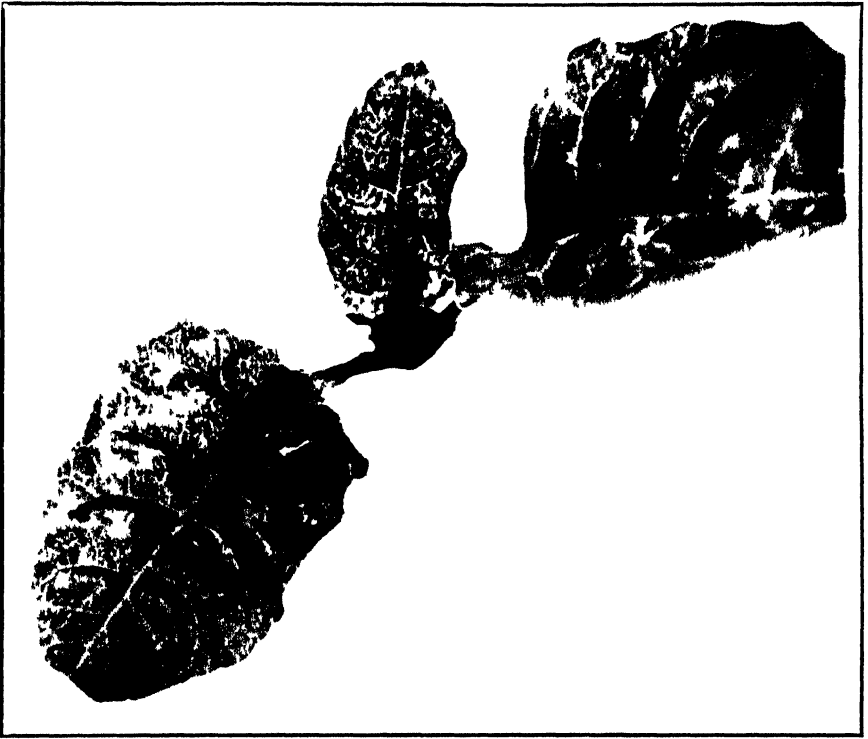


FIG. 1.—Susceptible seedling, showing a first symptom of Mosaic
viz. clearing of the veins.



FIG. 2 Typical mottling in young leaf of sugar beet
due to Mosaic



FIG. 3.—Sugar beet plant affected with a severe form of Mosaic. Note the wisting and distortion of the leaves.

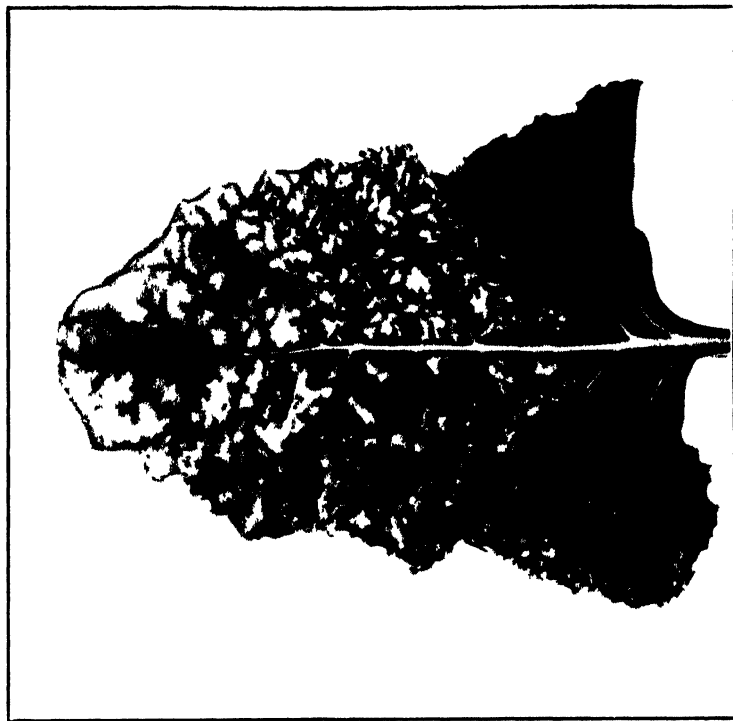


FIG. 4.—Leaf of sugar beet showing chlorosis, for comparison with the mottling due to Mosaic.

Beet Mosaic or Sugar-Beet

a greater degree of stunting and malformation than are those of sugar-beet or mangolds. Following the development of the same primary symptoms, the leaves of an affected spinach plant tend to curl downwards, while there is a narrowing of the lamina of the leaves of older plants. As the disease progresses, growth ceases, and the outer leaves become necrotic and die back. The whole plant is dwarfed and stunted and in some instances may actually be killed.

Chlorosis of Sugar-beet.—The writer has frequently received from growers specimen leaves of sugar-beet affected with a yellowish mottle. These have been accompanied by an inquiry as to whether this condition was Beet Mosaic. The mottle in question is illustrated in Fig. 4. It differs from the symptoms of Mosaic disease in that the yellowing is *uniform* without any differentiation into flecks or spots of light green, and there is no distortion. Usually the greater part of the plant, especially the older leaves, shows this chlorosis, and the condition can be distinguished from Beet Mosaic by the fact that the *youngest* central leaves show no mottling. Such chlorosis is due to nutritional disturbances or unsuitable soil conditions and has no connexion with any virus disease.

Weed Hosts of the Beet Mosaic Virus.—Certain weeds belonging to the Goosefoot family (*Chenopodiaceae*) are susceptible to infection with the virus of Beet Mosaic. Novinenko,⁴ in Russia, states that White Goosefoot (*Chenopodium album*) and *Amaranthus retroflexus* can be found infected with this disease. In addition the Perennial or Corn Sowthistle (*Sonchus arvensis*, Compositae), is said to be susceptible to the virus.

In the British Isles, White Goosefoot is not only a very common weed, but is frequently infested by the insect *Aphis rumicis*, one of the vectors of Beet Mosaic. The writer has transmitted the virus experimentally to this weed. Symptoms develop on the inoculated leaf after about seven days (under glasshouse conditions) in the form of circular zones with an indistinct central spot. Later, symptoms of general infection appear on the young leaves. Isolated yellow spots develop, together with a curling-under of the leaf edges; such affected leaves finally shrivel and die off. The virus is easily transmitted from diseased weeds back to mangolds and sugar-beet.

MOSAIC DISEASE OF SUGAR-BEET

Methods of Spread of Beet Mosaic.—An important and intimate relationship exists between plant virus diseases and insects, and in most cases a virus is dependent upon one or more species of insect for its distribution to neighbouring plants in the field. Such virus-carrying insects are known as *vectors* and those of Beet Mosaic are certain species of aphides or greenfly, namely, the Potato Aphides (*Myzus persicae* and *Macrosiphum gei*), and the Broad Bean Aphis or "Black Fly" (*Aphis rumicis*).

The virus of Beet Mosaic has been experimentally transmitted at Cambridge by means of two of these species, viz., *Myzus persicae* and *Aphis rumicis*, but the writer's attempts to convey infection by means of *M. gei* have given negative results. Infection experiments with leafhoppers and with the Common Green Capsid Bug (*Lygus pabulinus*) have also failed.

Myzus persicae seems to be the most efficient vector of the Beet Mosaic virus, and symptoms develop in a very high percentage of the experimental beet seedlings from 10-14 days after they are first colonized with the infective insects. Nevertheless, although *M. persicae* is so efficient an agent for the distribution of the disease, neither this aphis nor *M. gei* appear to play a large part in its dissemination in the field in England. A careful survey of the insect fauna in mangold and sugar-beet fields around Cambridge revealed the scarcity of these two aphides, except near potato crops. On the other hand, heavy infestations of the Broad Bean Aphis were observed in all the fields examined, and large numbers of this aphis were also seen on the susceptible weed White Goosefoot. The development and spread of the Beet Mosaic was coincident with the appearance of *Aphis rumicis* on sugar-beet and mangold crops in June and July.

The life-history of the Broad Bean Aphis may be outlined as follows:—The normal life cycle is spent partly upon woody and partly upon herbaceous plants, though it appears possible for the insect to live throughout the year upon herbaceous plants alone. The winter eggs are deposited on the Spindle Tree (*Euonymus*) during October, near the base of the leaf buds or in crevices of the branches. They hatch out in April, about the time of appearance of the young leaves. The aphides that arise from the winter eggs—"stem mothers," as they are called—produce a brood of wingless females which, in their turn, produce a race of

MOSAIC DISEASE OF SUGAR-BEET

winged females; and these migrate in May and June from the spindle tree to herbaceous plants such as the broad bean, mangold, sugar-beet, etc., as well as to docks and other weeds like White Goosefoot. The summer is spent on these herbaceous plants, where many generations of aphides are produced, the host plants being frequently almost smothered with the insects. During the summer, winged forms are produced that migrate to other herbaceous plants, either of the same or different species. In the writer's opinion this secondary summer movement of the aphides, which includes individuals leaving broad beans, is more particularly connected with the spread of Beet Mosaic. In September winged sexual individuals are produced, and these migrate to the spindle tree where the fertilized winter eggs are deposited.

Most workers are agreed that the virus of Beet Mosaic is not carried in the soil. Furthermore, although Ducomet in France considers that this virus is seed-borne, the consensus of opinion is against this view. One source of infection of field crops of beet is probably to be found in neighbouring infected plants of either mangolds or sugar-beet grown for seed, the disease persisting to the second year, of course, in seed-bearing plants. Another important source of mosaic infection is to be found in private gardens or wherever the biennial seakale beet and "perpetual" spinach are grown. These plants are commonly infected with the virus of sugar-beet mosaic, and thus not only afford opportunity to the virus for overwintering but act as a source of contamination to the new season's crop of sugar-beet. It is doubtful whether much spread of the virus is brought about by the ordinary processes of cultivation.

Transmission of Beet Mosaic by Artificial Methods.—With the exception of Hoggan,² most investigators of Beet Mosaic have been unable to transmit the virus by inoculating healthy plants with sap extracted from affected plants. The writer, however, has found the virus to be very easily transmitted to healthy seedlings of beet and its varieties, as well as to White Goosefoot, by the ordinary laboratory procedure of inoculation, viz., rubbing the leaves with a pestle dipped in sap from a plant affected with Mosaic. Primary symptoms develop in 5-7 days under glasshouse conditions, that is, more rapidly than when infection is conveyed by aphides under similar conditions.

MOSAIC DISEASE OF SUGAR-BEET

Effect of Beet Mosaic on Yield.—The reduction in yield of the sugar-beet crop, consequent upon Mosaic infection, has been calculated in one or two instances. According to Mouravieff,⁴ in Russia, the seed output is diminished by 12.9 per cent. and early infection of the root-crop involves loss of weight in sugar and in root. Estimates from field experiments, made at Bonn, in Germany, indicate an average loss of 20 per cent. from Mosaic disease, while the sugar content of fodder beet may be reduced to one-third of the normal quantity.

Control Measures.—The only methods of controlling Beet Mosaic at present known consist in efforts to keep down weeds such as docks, White Goosefoot, poppies and sow-thistles, which may serve, in certain instances, both as sources of virus infection and as hosts for the insect vector, *Aphis rumicis*.

Mosaic-infected beet or mangolds should be removed as soon as possible. According to Boning,¹ the symptoms of the disease are most severe if there is a deficiency of phosphoric acid; this therefore should be avoided. No varieties of sugar-beet or mangolds resistant to Mosaic are known.

Acknowledgments are due to Mr. F. C. Bawden and Mr. J. P. Doncaster for taking the photographs illustrating this article.

REFERENCES

- ¹ Boning, K, 1927 *Fortsch auf dem Gebiet der Pflanzenkr u der Immunität im Pflanzenr* III, pp 81-128
- ² Hoggan, I A, 1933 *Phytopath* 23, No 5, pp 446-474
- ³ Jones, L K, 1931 *Washington Agric Exp Stat Bull* 250, 16 pp
- ⁴ Mouravieff, V P, 1930 Extract in *Rev App Mycol*, XI, 1932, pp 89-91
- ⁵ Robbins, W W, 1921 *Phytopath* 11, pp 349-365

MARKETING NOTES

Milk Marketing Scheme, 1933.—The wholesale contract price for liquid milk in April was 1s. per gallon in all regions except the South-Eastern, where the price was 1s. 1d. per gallon. The manufacturing price in respect of milk manufactured into butter and cheese and condensed milk for export was 3½d. per gallon, while prices for milk manufactured into other products were as shown in the April issue of the JOURNAL.

Regional pool prices and rates of producer-retailers' contributions for April were:—

<i>Region</i>				<i>Pool Price Pence per gallon</i>		<i>Producer-Retailers Contributions Pence per gallon</i>	
Northern	...	...	...	10½	...	...	1½
North Western	...	...	...	10½	...	...	1½
Eastern	...	...	...	10½	...	...	1½
East Midland	...	...	...	10½	...	...	1½
West Midland	...	...	...	10½	...	...	1½
North Wales	...	...	..	10½	...	...	1½
South Wales	...	...	...	10½	...	...	1½
Southern	...	...	...	10½	...	...	1½
Mid Western	...	...	...	10½	...	...	1½
Far Western	...	...	...	10½	...	...	1½
South Eastern	...	...	...	11½	...	...	1½
England and Wales (unweighted average)				...	10'64	...	...
							1'34

Producer-retailers who sold no milk by wholesale on contracts other than those carrying level delivery premiums were credited with a level delivery premium of ½d. per gallon off the above contributions.

The Inter-Regional Compensation Levy was fixed at 1d. per gallon on all liquid milk sales and the whole of the fund so raised was apportioned to the regional pools in proportion to the quantity of milk sold for manufacturing purposes.

The expenses levy remained unchanged at ¼d. per gallon on all sales of contract milk.

In a report on the operations of the Board, recently issued to all registered milk producers, it is stated that the

MARKETING NOTES

total quantity of milk sold through the Board during the first six months of the Scheme was as follows :—

MONTH	Total Gallonage of milk sold by Registered Producers under Wholesale Contracts	Total Gallonage of Milk sold for liquid consumption	Total Gallonage of Milk sold for manufacturing purposes.	Total Gallonage of Milk sold by licensed Producer-Retailers.
1933				
Oct. 6 to 31	44,552,295	37,446,043	7,106,252	9,348,045
November	51,882,741	43,049,808	8,832,933	9,785,108
December	53,514,437	44,514,037	9,000,907	9,779,170
1934				
January	55,270,732	44,056,080	11,214,652	9,323,298
February	52,430,512	41,050,170	11,380,342	8,260,345
March	60,767,092	45,033,216	15,733,876	9,352,757
	318,418,316	255,149,354	63,268,962	55,848,723

The total quantity of milk sold through the Board was, therefore, 374,267,039 gallons. The estimated sales under wholesale contracts for the month of April were 63,051,140 gallons.

Elections.—Elections of County Representatives to serve on Regional Committees were held on May 19 in forty-two administrative counties. Under the Milk Marketing Scheme one-third of the number of representatives elected on November 25 last were due to retire in May. The elections were held to fill the places of the retiring representatives.

Elections of Regional Members of the Milk Marketing Board will be held on June 2. Two members will be elected for the North-Western Region and one member for each other Region.

The Annual General Meeting of the Board will be held on June 8. The business to be transacted includes the election of three Special Members to serve on the Board. The members of the present Board go out of office on June 30.

Pigs and Bacon Marketing Schemes :—Results of Pig Grading.—The following Table shows the grading results of pigs delivered under contracts during March (the first month of the new contract period), compared with those for the first and last months of the old period, viz., November, 1933, and February, 1934 :—

MARKETING NOTES

				1933. November. per cent.	1934. February. per cent.	1934. March. per cent.
Grade A	..	..	..	4.9	11.9	14.1
" B	..	..	..	20.1	28.7	30.6
" C	..	..	..	18.8	16.6	20.2
" D	..	..	..	33.2	22.9	19.5
" E	..	..	..	3.2	1.8	1.5
Class 4 (ungraded)	..	..	..	4.5	1.9	1.0
Ungraded but accepted by curers				7.8	11.9	9.8
Rejected	..	..	..	7.5	4.3	3.3

The improvement in the proportion of higher-grade pigs, which occurred over the first contract period, continued in March and there was also a further fall in the percentage of rejects.

A similar improvement has taken place in the weight of pigs delivered, judged by their suitability for the production of Wiltshire type of bacon. The percentages of Class 1 (140-170 lb. dead weight) pigs in the months in question were as follows:—

November, 1933	..	..	..	44 per cent.
February, 1934	..	..	..	61 " "
March, 1934	.	.	.	69 " "

The relatively small proportion of Class 1 pigs last November was due to the holding up by producers of pigs that were ready for slaughter in October, in order to obtain the contract prices.

Transport of Pigs.—The arrangement made between the Railway Companies and the Pigs and Bacon Marketing Boards whereby all pigs sold to curers (except in certain agreed circumstances) are to be transported by the companies at a flat rate of 1s. 8d. was sanctioned, on May 15, by the Railway Rates Tribunal.

Sugar-Beet Marketing Scheme.—A scheme under the Agricultural Marketing Acts, 1931 and 1933, for the regulation of the marketing of sugar-beet in Great Britain has been duly submitted to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland.

Copies of the scheme may be obtained, on payment of 6d. per copy (post free), from the National Farmers' Union, 45, Bedford Square, London, W.C.1, or the National Farmers' Union of Scotland, 124, St. Vincent Street, Glasgow, C.2, or may be inspected on personal application at the above-mentioned addresses (except on public holidays) between the hours of 10 a.m. and 5 p.m. on weekdays, and 10 a.m. and 12 noon on Saturdays.

Any objections and representations with respect to the

MARKETING NOTES

scheme should be made to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, and addressed to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, the Under-Secretary of State for Scotland, Scottish Office, Whitehall, London, S.W.1, or the Secretary, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh, so as to reach them not later than June 23, 1934; objections received after that date will not be considered. Every objection must be made in writing and must state the grounds of objection and the specific modifications required.

National Mark Eggs.—The total output of the National Mark Egg Packing Stations for the three months January to March, 1934, was 133·9 million eggs, of which 109·7 million were packed under the National Mark, as compared with 125·6 million and 101·6 million, respectively, for the corresponding period of 1933. The following table shows the aggregate monthly output (in millions) of the Stations during these periods:—

Month	1933			1934		
	Total Output of Packing Stations (Fresh Eggs)	Output under National Mark	Percentage of Total Output packed under National Mark	Total Output of Packing Stations (Fresh Eggs)	Output under National Mark	Percentage of Total Output packed under National Mark
Jan. -	35·1	29·1	84	36·5	30·4	83
Feb. -	35·0	28·9	82	39·0	32·3	83
Mar. -	55·5	43·6	78	58·4	47·0	80
Totals for 3 Months	125·6	101·6	81	133·9	109·7	82

A report has recently been prepared by the Ministry of Agriculture for Northern Ireland on the results of experiments carried out by that Department during 1933 for the purpose of testing the conclusions reached as a result of earlier investigations, namely, that eggs packed air cell or broad end upwards would, whether in transit or undisturbed in store, remain in good condition longer than eggs packed air cell or broad end downwards.

MARKETING NOTES

The report fully confirms the earlier conclusions, and particulars are being communicated to all authorized packers in the National Mark Egg scheme.

Applications for authorization in the scheme continue to be received. Most of these are from collectors, but some of the applicants propose to work on a co-operative basis. Inquiries have also been received recently from a number of wholesale provision firms, who contemplate setting up egg-packing stations, and it is expected that at least one co-operative packing station will be operating in Wales in the near future.

National Mark Vegetables.—At present, one of the hindrances to the orderly marketing of vegetables is the multiplicity of containers used, for it not only causes confusion but is uneconomic. As an extreme example, no fewer than 40 different types of container are used for the carriage of lettuce, and with all vegetables many different kinds are employed. It is obvious, however, that, with slight alterations in dimensions, and in some instances no variation at all, certain of the containers would be suitable as standard containers for a number of vegetables. If these were accepted by the trade, an appreciable reduction could at once be made in the number of containers now in use.

One of the main features of the National Mark schemes is the prescription of a limited number of standard packages that are intended to facilitate the practice of buying by description. As far as possible, the containers prescribed for National Mark vegetables have been of the non-returnable type, but representations made from various quarters indicate that there are decided differences of opinion as to the need for emphasis on the use of non-returnables, more specially when produce is despatched over short distances by growers who are near their markets.

The question of standard containers has recently been fully considered by the National Mark Vegetables Trade Committee, particular attention being given to the various types of returnable and non-returnable containers now in use for the consignment of vegetables to market. The Committee, having obtained the views of representative growers in the principal areas of production as to the containers most commonly in use for long-range and short-range marketing of the various kinds of vegetables, has recommended a list of standard containers for use in the marketing

MARKETING NOTES

of National Mark vegetables. This list, which has been adopted provisionally by the Ministry and will be subject to review after a year's experience, is divided into non-returnable and returnable containers, the latter being limited to short-range marketing, that is, up to 50 miles from markets.

A copy of the list of approved containers may be had, free of charge, upon application to the Ministry.

On the recommendation of the Trade Committee it has also been decided that the date of packing shall be declared, in code, on all National Mark Vegetable labels, for which purpose the Ministry's present code marking calendar will be used. As regards packers already enrolled in existing schemes, this requirement, which is experimental and will be reviewed in September, 1935, will operate from September 1, 1934. In the case of schemes still to be introduced, this requirement will operate from the commencement of the schemes.

National Mark Dressed Poultry.—A competitive show of table poultry, organized by the Gloucestershire Agricultural Education Sub-Committee in co-operation with the Poultry Instructors of fifteen other counties, was held recently at the Smithfield Central Markets. It attracted a large entry and caused keen rivalry. The quality of the poultry was generally good, and indicated how successfully the progressive home producer can meet the requirements of the high-class trade. All entries in the three classes were required to be of one dozen graded chickens, packed in standard non-returnable crates.

Among other awards, National Mark packers secured, not only the first prize, but also three "highly commended" awards in Class C for a pack of 12 chickens, maximum weight 30 lb. The competition generally bore witness to the close attention which is now being paid to standardization in the marketing of English table poultry.

The Fat Stock Direct Consignment Schemes.—In conjunction with the North Wales Marketing Committee of the National Farmers' Union, arrangements have been made whereby producers will co-operate in making up bulk consignments of Welsh lambs for disposal on a grade and dead-weight basis at Liverpool and Birmingham wholesale meat markets. The procedure is similar to that which proved successful last year (see August and December, 1933, issues of this JOURNAL).

MARKETING NOTES

During the four months ended April 30 last, 1,891 cattle, 2,994 sheep and lambs and 591 pork pigs and sows were dealt with under the Ministry's scheme at the various grading centres, making totals to date of 6,454 cattle, 19,962 sheep and lambs and 617 pigs.

Marketing Demonstrations at Agricultural Shows.—

The Ministry's Marketing Demonstrations at Agricultural Shows commenced this year with the Devon Show at Newton Abbot, May 22 to 24, followed by the Bath and West at Oxford, May 30 to June 2. During June the Ministry's pavilion will be seen at the Royal Counties (Salisbury), June 6-9; Northants (Kettering), June 8-9; Three Counties (Hereford), June 12-14; Royal Cornwall (Camborne), June 12-13; Sussex (Brighton), June 20-21; Lincolnshire (Gainsborough), June 20-22; and Peterborough, June 26-28. The Ministry's own exhibits deal mainly with the National Mark schemes, with special reference to the recently-introduced schemes for vegetables. Working demonstrations will be given as follows:—Egg grading and packing at the Royal Counties and Sussex Shows; onion grading at Northants and Peterborough; apple grading and packing at the Three Counties. A cinema will be included at all Shows, where films on marketing will be continuously shown.

The Marketing Boards are this year joining forces with the Ministry at certain of the Shows. The Milk Board will be represented at the Royal Counties, Three Counties and Sussex; the Pigs and Bacon Boards at the Royal Counties, Three Counties and Cornwall, and the Potato Board at the Three Counties, Lincolnshire and Peterborough. Besides exhibits illustrating the work and objects of the Boards, officers of the Boards will be in attendance and farmers and others will thus have an opportunity of discussing with them any points arising in connexion with the Marketing Schemes. It is hoped that producers will take advantage of this opportunity.

Another innovation this year is the inclusion, in the Ministry's pavilion, of an exhibit by the British Broadcasting Corporation, who during June will be represented at the Royal Counties, Three Counties, Sussex and Peterborough Shows. By means of broadcast talks to farmers, the B.B.C. are endeavouring to render practical service to the industry, and their exhibit will illustrate the

MARKETING NOTES

scope of this service. The officials of the Corporation hope to establish personal contact with farmers at these shows, and to secure first-hand information that will be of assistance to them in planning their programmes.

The Use of National Mark Products by Public Authorities.—During the current year the Ministry is continuing its policy of approaching important public authorities in order to persuade them to specify "National Mark," wherever possible, in their periodical tenders for the supply of foodstuffs to institutions under their control.

The Bristol Public Assistance Committee has recently notified the Ministry that, in future, provision will be made in their tender forms for apples, eggs and poultry to enable firms to quote for National Mark supplies, stating the grades offered.

The Liverpool Corporation has also announced that instructions have been given for provision to be made in their tender forms for alternative prices to be quoted in cases where National Mark produce can be offered.

Publicity for Home-Grown Flowers and Plants.—The Flowers and Plants Publicity Committee of the Ministry, in collaboration with H.M. Office of Works, has carried through to completion, as far as the 1934 season is concerned, the work of transforming the Inner Circle Gardens in Regent's Park, London, into a centre for the display of British roses and shrubs. The established British rose garden, which has attracted considerable public attention, is now in its third year, and the new shrub garden, which has been planned so as to provide continuous flowering throughout the year, contains 50 species and 150 varieties of flowering shrubs contributed from the stocks of nursery-men in the United Kingdom.

In June the Ministry will publish a list of growers and varieties of shrubs, which will serve as a guide to the new garden. The guide to the rose garden, which has been in great demand during the past two years, has been revised and will also be published during June.

A list of varieties of bulbs that are grown on a commercial scale in this country has been prepared, primarily for the information of the numerous Local Authorities who have been requested to give sympathetic consideration to the question of buying British bulbs for the purpose of planting in their parks and gardens.

MARKETING NOTES

Representations have been made to the Ministry that while some bulb dealers have given valuable prominence in their bulb catalogues to the home-grown product, others may not be giving to this matter the attention that it merits. Progressive-minded dealers will recognize that it would be advantageous to prepare for the rising demand for home-grown bulbs resulting from this propaganda campaign, and would assist intending purchasers if dealers would include in their catalogues for the forthcoming season a special section for British bulbs in which varieties that are produced on a commercial scale in this country would be listed and described.

Marketing Reorganization in Guernsey.—The Guernsey *Billet d'Etat* for April 13, 1934, publishes the report of a Committee appointed by the States last October, to investigate the condition of agriculture, with the object of assuring to the inhabitants an adequate supply of milk, butter and other agricultural products.

Figures are quoted in the report from a census taken in December, 1933, showing a decline, since December, 1931, of 3 per cent. in the numbers of cows in milk or in calf, and of 16 per cent. in heifers over one year old. Heifers under one year old have increased by 1 per cent. The cost of distribution of milk is estimated at $\frac{3}{4}$ d. to 1d. per pint, which is not considered by the Committee to imply unreasonable profits to retailers.

The chief reasons for the depression of the industry are stated to be as follows:—

- (1) The sale of Guernsey cattle to American buyers is in abeyance;
- (2) The trade with England in Guernsey cattle is much less profitable than formerly owing to the fall in prices, although it has increased in volume;
- (3) The competition of imported butter and preserved milk has become stronger; and
- (4) The cost of labour is now much higher than before the War.

The report also draws attention to complaints of adulteration of milk, and of the colouring of imported butter to make it resemble the local product.

The Committee conclude that the solution of the milk-producer's difficulty can only be found in the elimination of price cutting and in the provision of some form of control of the milk industry. With this object in view, they recommend, in the first place, that a law more or less on the lines of the Agricultural Marketing Acts of Great Britain should be enacted, enabling producers of agricultural products to

MARKETING NOTES

formulate schemes for regulating the marketing of their output. The persons submitting a scheme would have to satisfy a body, appointed by the States for the purpose, that they were substantially representative of the producers of the product concerned. After the scheme had been duly considered, and opportunity had been given for objections to be made, it would be submitted to the States. If approved by them it would be submitted to a poll of registered producers of the regulated product, and, if approved by the required majority, it would have the force of law as regards all producers of the product. One major point of difference from the legislation in force in Great Britain is that each scheme would be administered by a Board of Directors composed of persons elected by the States, representing not only producers but also distributors and consumers.

Referring to the work of the English Milk Marketing Board, the Committee point out that a producers' board in Guernsey could prevent price cutting by fixing minimum prices, and could take steps to promote increased consumption of Guernsey milk and cream. The possibility of free milk distribution in schools is mentioned.

As regards other products, such as pigs, corn, roots, hay, etc., the Committee state that in their opinion there are no legislative steps for the restriction of imports that can be taken to help the farmer; but they point out that the proposals for a local Marketing Act, if adopted, would enable schemes to be introduced for the marketing of other products such as eggs.

Canada: Natural Products Marketing Bill.—The object of this Bill, which was introduced by the Canadian Minister of Agriculture and read for the first time on March 26, 1934, is "to improve the methods and practices involved in the marketing of natural products in Canada, and in export trade." The term "natural product" is defined as "any product of agriculture or of the forest, sea, lake or river and any article of food or drink wholly or partly manufactured or derived from any such product." Timber and fish are therefore included, but minerals are excluded.

The Bill is in two parts. The first deals with the regulation of marketing; the second with investigations into marketing, with special reference to costs and margins.

The machinery for marketing regulation provided for in

MARKETING NOTES

the first part of the Bill consists of a Dominion Marketing Board and local boards. The Governor in Council is given discretionary powers to establish the Dominion Board, to appoint a Chairman and fix the number, term of office and remuneration of the members. He may authorize payment of the Board's expenses under the Bill from the Consolidated Revenue Fund. The Board's functions are to exercise the powers conferred by the Bill and to advise the Minister designated by the Governor in Council to administer it. This Minister need not necessarily be the Minister of Agriculture.

Though the spheres of action of local boards may be limited geographically, the intention seems to be that they should normally be "commodity" boards. The constitution of such local boards is not laid down in the Bill, but is left to the provisions of the individual marketing schemes.

Marketing schemes under the Bill may differ somewhat according to whether the initiative in forming them is taken by producers or distributors, on the one hand, or by the Minister on the other. A scheme submitted by producers or distributors must provide for a local board to regulate the marketing of the product under the supervision of the Dominion Board. The Minister, if satisfied that the scheme is submitted by a representative number of producers or distributors, must refer it to the Board. If they approve it, with or without amendments, he may recommend it to the Governor in Council, who may finally approve it and fix a date for its commencement. The scheme as approved must state the regulated product; full information respecting the quantity of the product produced and its markets; the area covered; full details of arrangements for administration and organization, including the number of persons constituting the local board and the basis of their selection, etc.; the powers to be exercised by the local board under the supervision of the Dominion Board; and any other information required by regulation or by the Minister.

The Minister may also submit a scheme to the Governor in Council even though no petition has been made by producers or distributors in respect of the product in question, provided that he is satisfied that the trade and commerce of the product are injuriously affected by the lack of a local board to regulate it. The Governor in Council may approve the scheme and authorize the Dominion Board to administer it, either directly or through some other agency.

MARKETING NOTES

The range of marketing powers available for use in schemes of either type appears to be limited to certain powers explicitly granted to the Dominion Board in the Bill, although this point is not entirely free from doubt. The chief of these powers may be summarized as follows:—

Regulation of the time and place of marketing the regulated product, determination of the manner of distribution and of the quantity, quality or grade of the regulated product that shall be marketed by any person at any time; prohibition of the marketing of any of the regulated product, of any grade or quality.

Compensation for losses in marketing, storing, exporting, etc., sustained as the result of an Order of the Board.

Financial assistance for the provision of facilities for preserving, storing or conditioning the product and for marketing research.

Registration or licensing of producers or distributors.

Collection of information and returns relating to the production and marketing of the product.

Co-operation with marketing boards or agencies established under provincial laws.

Collection of levies.

Authorization of local boards under the Bill to exercise such powers as are necessary for a proper enforcement of the scheme, subject to the power of the Dominion Board to withdraw authority to use any or all of its powers; to obtain full information from local boards; and to advise them.

The final decision for the revocation of a scheme rests with the Governor in Council; but a representative number of persons operating under the scheme may petition for revocation.

Important provisions in the Bill are designed to reconcile federal and provincial interests. No scheme may be approved unless the Governor in Council is satisfied either that the principal market for the product is outside the province of production or that some part of the product may be exported—i.e., that federal interests are in some way involved. Further, wherever a scheme relates to a production area lying within one province, any provincial marketing board or agency may be constituted a local board for the purposes of the scheme; and the Dominion Board may exercise powers conferred on it by provincial legislation and co-operate with provincial boards or agencies.

The Governor in Council may by order or regulation, restrict the importation into Canada of any natural product which enters Canada in competition with a regulated product, and may make regulations for the licensing of importers.

Part II of the Bill provides for far-reaching powers of investigation. The Minister, at the request of the Board or on his own initiative, may authorize an investigation into matters relating to the production and marketing, pro-

MARKETING NOTES

cessing or conversion of any natural product, such as costs of production, trade practices or methods of finance. He may demand regular returns of information from persons concerned in such matters. If he believes, as a result of such investigations, that the situation demands further inquiry, the Minister may set up a Committee for this purpose, consisting of representatives of producers and persons engaged in marketing, adaptation for sale, processing or converting, and of consumers, with a Chairman representing the Minister. The Committee will have wide powers to conduct inquiries into all operations connected with the marketing, adaptation for sale, processing or conversion of the regulated product, for the purpose of ascertaining the "spread" (i.e., margin) received by any person engaged in these activities, and whether the spread is detrimental to the public interest. As a result of its investigations the Committee may determine what spread is detrimental to the public interest, and may publish its findings. Any person who, to the detriment of the public interest, "charges, receives or demands to receive any spread which is excessive, results in undue enhancing of prices or otherwise restricts or injures trade" in the regulated product will be guilty of an indictable offence and liable to very heavy penalties.

The Bill in the present form presents obvious resemblances to the Agricultural Marketing legislation of Great Britain, but there are some striking differences. For example, the Bill provides powers for the regulation of all marketing processes; and not merely all producers, but all distributors of the regulated product as well may be required to become registered under a scheme. The Executive is given much wider discretionary powers, as regards, for example, the structure of marketing schemes and of local boards. The democratic element is much less pronounced; schemes are not submitted to a popular vote, nor is it a statutory provision that members of local boards should be elected. No powers to trade in the regulated product are available. The Dominion Marketing Board, as a supervisory body over individual "local," or commodity boards, has, at present, no counterpart in the arrangements in this country; but, on the other hand, the United Kingdom difficulties of adjustment as between the interests of England and Wales, Scotland and Northern Ireland are probably much less than those likely to arise from the federal-provincial inter-relations in Canada.

MARKETING NOTES

Canadian Bacon - Grading Regulations.—In the February, 1934, issue of this JOURNAL (p. 1067), reference was made to an Order in Council issued by the Canadian Government under the Live Stock and Live Stock Products Act, 1927, which gives the Dominion's Minister of Agriculture power to license the export of bacon to the United Kingdom, conditionally on the exporter conforming to regulations regarding, *inter alia*, the method of grading and packing and the marking of both the bacon and the package. Three bacon grades have now been prescribed by the Minister for export bacon as follows:—

Grade A = (a) shall possess balance, bearing a good proportion of lean to fat, of meat to bone, well shaped, with fore end not out of proportion to the side, with streak reasonably thick and with full tapering ham; and the quality and texture of the fat must be firm to the touch;

(b) shall be neatly butchered and trimmed, presenting a clean-cut, bright appearance, and must be reasonably free from scratches, bruises or blemishes of any kind;

(c) the cure shall indicate freshness of flavour and the necessary mildness of cure to indicate a satisfactory condition upon arrival in the United Kingdom.

Grade B = (a) shall be of good quality but may include sides which have imperfections in conformation and type;

(b) shall be neatly butchered and trimmed and free from serious bruises;

(c) the cure shall indicate freshness of flavour and mildness necessary to good condition upon arrival in the United Kingdom;

(d) this grade shall not contain soft or very thin sides.

Grade C = all bacon not eligible to be placed in Grade A or Grade B.

Three selections are provided on the basis of back fat measurements, which are defined in each case. The maximum thickness of fat at two points on the back is prescribed for four different weight ranges.

No. 1 Selection or Leanest.		Shoulder.	Middle of Loin.
50/55 lb.		1½ in.	1½ in.
55/60 "		2 "	1½ "
60/65 "		2 "	1½ "
65/70 "		2½ "	1½ "
No. 2 Selection or Lean.			
50/55 lb.		1 in.	1½ in.
55/60 "		2½ "	1½ "
60/65 "		2½ "	1½ "
65/70 "		2½ "	1½ "
No. 3 Selection or Prime.			
50/55 lb.		2½ in.	2 in.
55/60 "		2½ "	2 "
60/65 "		2½ "	2 "
65/70 "		2½ "	2½ "

Shoulder measurements are to be taken just behind the thickest point of fat on the shoulder and at a point above the first rib. The "middle of loin" measurement is to be taken at a point above the last rib.

JUNE ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington.

JUNE ranks as one of the busiest months, although work among live stock is lighter than at any other period. Field operations tend to absorb the whole of the available labour, and this is even more marked where the date of hay harvest has been advanced in conformity with the growing appreciation that early-mown hay is richer in feeding value than that made from grass that has gone to seed. The rapidity of growth that is characteristic of the month of May is continued during June in most seasons. Actually, there is a greater fall of rain in June than in any of the six preceding months, as far as the Eastern Midlands are concerned, though thunder rain probably has some bearing on this. Total rainfall in any month is not a reliable index of relative wetness. During the heat of summer evaporation is particularly rapid and this is true of much summer rainfall.

In recent years June has been the sunniest month of the year, a feature that is good both for the killing of weeds in root crops after hoeing and for the curing of hay. Curing of hay is not usually rapid during the first half of the month, but this is not a good reason for a delay in cutting. June weather, however, may have a vital influence on the progress of arable crops and grass. A prolonged period of rain and cold hampers the development of root crops in particular, while a spell of dry hot weather tends to hasten the maturity of grass for hay and to reduce the feeding possibilities on pasture land. At the time of writing the appearance of grass supports the observations made last month, that under favourable conditions of growth pastures would yield an abundance of grazing even in the absence of nitrogenous top-dressings. The growth of grass on meadows is also indicative of a good hay crop. It is very probable that it will not be necessary to wait for bulk this year as an excuse for not starting hay harvest in June. Weather conditions and the pressure of other work—especially that on root breaks—usually determine the starting date.

The Summer Shows.—The summer show season normally extends from May to September. The importance

JUNE ON THE FARM

of these events varies greatly with the district. In recent years there has been a tendency to eliminate some of the smaller local fixtures and to concentrate on a number of major exhibitions. The experiences of county agricultural societies have not been uniformly satisfactory, and the amalgamations that have taken place in several instances have been attended by definite improvements. In many instances the old-time functions of agricultural shows seem to have been largely superseded. The original object of shows was primarily the furtherance of live-stock improvement. At the more important fixtures their field of usefulness has been widened. Farming to-day is more than ever dependent upon aids to economic production, and the trade and implement stands at a modern show can profitably absorb a good deal of the visitors' time.

The question of live-stock improvement as dictated by show-ring standards has recently been criticized. The suggestion is made that in awarding prizes on a basis of inspection points in the dairy breeds too much attention is paid to conformation and too little to productive capacities. This criticism was not only intended to apply to the recognized breed judges, but also to the members of Young Farmers' judging teams. There is possibly a germ of truth in this particular criticism, but the breeders of dairy cattle are generally sufficiently progressive to know the type of animal for which the best demand exists. This is what in ordinary practice proves to be the most suitable type. Fashion has been known to influence judgment in the show ring, but generally the basis of instruction for Young Farmers' teams is founded on the score-card system, in which fashion has no place. The hall-mark of constructive breeding, however, is the attainment of uniformity in type throughout the herd. Breeding that only seeks to stimulate production without reference to other points would quickly bring about the deterioration of cattle stocks from the very pleasing animals that grace the show rings to-day. There is in fact conclusive evidence that during the last 150 years pedigree stock-breeding has brought about a substantial improvement in the general level of merit in the cattle stocks of the country.

The exhibiting of live stock is very much a specialist's job. Criticisms have frequently been made concerning the amount of artificiality that is sometimes associated with the preparation of live stock for the show ring. This is

JUNE ON THE FARM

particularly met with amongst sheep and especially in respect of their colouring. Some breed societies have taken steps to control the "make-up" permissible, but it is sometimes difficult to know where to end in this respect. The old argument in favour of colouring dates back to the days when sheep were drawn from the arable fields for exhibition. Those that carried the natural "bloom" of the soil in their fleeces appeared more attractive to the eye than those animals lacking the colour. Hence colouring became fashionable.

The extent to which it is desirable to fatten stock for the summer shows is again a debatable matter. Many farmers have a legitimate grievance that in view of the specialized preparation that is now general, it is increasingly difficult to win with an animal from an ordinary herd. One cannot justify the practice of allowing a very short lactation for show cows so that they might carry the abundance of bloom that is generally characteristic of the show cow. It is probable that the bull classes are the most unsatisfactory from the viewpoint of judging, especially in the dual-purpose breeds. At the major shows the classification usually ensures the exhibition of animals eligible on the milk records of the dams, but at the local shows all types often have to compete in the same classes. It is this fact that so often makes exhibiting a gamble, depending on the interpretation of desirable type by the selected judge.

Root Breaks.—There has been a real danger in recent years to overlook the fact that the root break serves two purposes, and that the cleaning of the land to benefit the rest of the rotation is as important as the provision of food for live stock or the availability of cash crops. The temptation to economize in cultivations is always a very real one when finances are low. Generally, however, it will prove to be false economy in the long run, for a neglected root break not only means a reduced output of crop but endless trouble in the succeeding crops as far as weed competition is concerned. Early June in particular is identified with weed elimination by means of horse- and hand-hoeing, while the efficiency of singling can also be an additional aid to weed control.

If the preliminary cultivations have been directed towards the control of the more objectionable weeds, such as couch, the fact still remains that most soils are heavily populated

JUNE ON THE FARM

with annual weeds that are the cause of serious competition. Much can be done, even with these, by ensuring early germination before the actual sowing of the root crop, but their chief enemy must be the horse-hoe. One of the most satisfactory developments in recent years has been the introduction of light-type multi-row horse-hoes that cover the ground rapidly and without undue fatigue on the part of the labourer. In the early stages of growth the use of discs enables efficient horse-hoeing to be practised quite close to the growing plant, without the original criticism that the young plants tended to be smothered with soil and loosened weeds. The efficiency of multi-row hoes has been particularly appreciated since the sugar-beet crop achieved popularity. With sugar-beet it is very definitely true that to spare the hoe is to spoil the crop. Fortunately there is evidence that beet culture has done more to improve the efficiency of farming in recent years than any other single influence. This not only concerns cultivations, but also manuring and the development and extension of the piece-work system of labour.

Singling.—Most of the hand labour during the first half of June is concerned with the thinning of sugar-beet and mangolds. This operation has an important influence on the ultimate weight of crop harvested, but it must be recognized that efficient singling is only possible when the plants are regular in the rows. Various investigations are proceeding in relation to the factors that make for uniform germination of seed and regular spacing of seed in the rows by drills. The efficiency of some drills is open to question, but it should not be overlooked that a fertile seed-bed with a satisfactory tilth will do much to secure the uniformity in plant that is so desirable.

Two factors call for special consideration in relation to singling. Examination of the plants in the rows will reveal that some are more forward in growth than the others. Careful observation indicates that if these plants are left to form the crop, the resulting crop will be heavier than if no discrimination had been exercised. It is naturally impossible to ensure that workmen singling at piece-work rates will always leave the best plants. Regularity in spacing at the time of thinning is equally important. One of the early mistakes in beet culture was to leave the plants too close together. Such plants never attain an economic size

JUNE ON THE FARM

for easy handling at lifting time. The ideal is probably secured by leaving the plants about 9 in. apart in the row. Unless the work is closely checked it is quite easy to exceed this spacing, and the best method is to count the number of plants in a chain of drill row. Some growers award bonus payments to workers who produce accurate results in the thinning of the crop. It is occasionally suggested that the distance at which plants are left should vary with the soil and level of fertility. This implies that on good land more room can be given and that on poorer land, closer thinning is specially important.

In the singling of mangolds, it is customary to leave the plants at from 10 to 15 in. apart. When the crop is taken in rows 21 in. apart, it is probably advisable to give the individual plants the maximum distance if well-grown roots are desired. It is now customary on a number of farms to adopt precisely the same cultivations for mangolds as for beet, and the narrower drill width has proved quite satisfactory provided adjustments are made in the singling widths. Early singling in both beet and mangold crops is desirable, since this has a marked influence on crop yield. It is a point of interest that hand singling is generally held to be the most efficient method, but it is only practised as a regular custom in Westmorland, Cumberland and the south-west of Scotland. The use of the hoe is definitely more rapid, and the skilled user causes little damage to the plants.

In the Midlands June is the usual month for the sowing of swedes. Earlier sowing courts the possibility of mildew attack, a trouble that does not cause much damage in the north where earlier seedings are advisable. Turnips in common with all Brassicas are the victims of the turnip flea beetle. The critical period for attack is when the plant is in the seedling stage before the rough leaves have developed. The beetle was already active before mid-May and had caused damage to early-sown kales and other crucifers. The means of controlling the pest are in some ways closely connected with good farming, though this does not always hold good. Here again desirable tilth with moisture conservation and a high level of fertility tend to ensure more rapid germination and the development of the plant into the rough-leaf stage. It is suggested that soaking the seed in turpentine before sowing is a means of minimizing the more serious losses that may result. The writer has made a point of using turpentine in this way for a number of years

JUNE ON THE FARM

with results that are distinctly favourable. Various devices have been recommended for use when a bad attack is noticed before the damage is pronounced. Thus much good can be done by drawing across the field a lath to which sacks soaked in paraffin have been attached. Dusting the crop with slag is a further remedy. (See also the Ministry's Advisory Leaflet No. 109, *Flea Beetles*.)

Live Stock.—For most classes of live stock June is a favourable month. By this time young cattle are more or less acclimatized to the grazing season, while cattle that have been out the previous winter begin to show a marked improvement in condition. Forward fattening cattle now usually command a brisk trade, and some graziers nurse this particular market. The dairy herd is never easy to manage on grass if one attempts to study feeding on a scientific basis. The variation in quality and the inability to control adequately the amount of nutrients consumed are problems that give rise to difficulties. Controlling the hours of grazing or the use of a bare field for resting, introduce complications, but quite a number of progressive dairy farmers are finding it profitable to study summer feeding as closely as winter feeding.

It is sometimes possible to kill two birds with one stone in the matter of controlled grazing. Thus in hot weather dairy cattle are none the worse for being housed during the heat of the day. It is often easier in this way to give them protection from flies. If housing is adopted, however, it means additional labour for the extra cleaning out of cowsheds and the use of litter. The fact that the pastures do not receive their normal supply of dung from the animals is probably an advantage than otherwise, since the wastage of grazing by dung is fairly considerable, especially on intensively-stocked land. It is essential during the heat of summer to pay special attention to milk production to ensure good keeping qualities. This implies extra care in the washing and sterilization of utensils, while the refrigeration of the milk should be efficient. The increased use of electricity is making it possible to employ milk-cooling plants that reduce the temperature to a satisfactory level, though efficient refrigeration is no real substitute for cleanliness in the production of milk.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended May 9				
	Bristol	Hull	L'pool	London	Cost per unit at London
Nitrate of soda (N. 15½%) ..	£ 7 18d	£ 7 18d	£ 7 18d	£ 7 18d	s. 10 d. 2
" " Granulated (N. 16%) ..	7 18d	7 18d	7 18d	7 18d	9 9
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20.6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium cyanamide (N. 20.6%)	7 5s	7 5s	7 5s	7 5s	7 0
Kainit (Pot. 14%) ..	3 6	3 0	2 17	3 0g	4 3
Potash salts (Pot. 30%) ..	5 4	5 1	4 17	5 0g	3 4
" (Pot. 20%) ..	3 15	3 9	3 6	3 10g	3 6
Muriate of potash (Pot. 50%) ..	9 8	9 1	8 15	9 2g	3 8
Sulphate " (Pot. 48%) ..	10 12	10 7	10 0	10 7g	4 4
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26-27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16k	3 6
" (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	7 15	6 17	6 15f	6 7	..
Steamed bone-flour (N. 4%, P.A. 27½-29½%) ..	5 5	5 12	5 15f	5 7	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc. (Agric.),
Principal, Moulton Farm Institute, Northampton.

Feeding in Relation to Anaemia in Farm Animals :

—A comprehensive account of nutritional anaemia of man and animals has been written by Professor Davidson and Dr. Leitch* and contains much information that is of direct application in the feeding of farm live stock.

As long ago as 1923, McGowan and Crichton described a case of severe anaemia in sucking pigs that gave rise to high mortality. In this instance the sows and litters were kept indoors in pens on cement floors, and the sows were fed on a ration consisting of fish meal in conjunction with crushed maize and wet distillers' grains. It was found that the disease could be prevented or cured by feeding ferric oxide to the little pigs. Subsequent investigations made by Adersen, which were discussed in these notes in March, 1933, showed that this condition of anaemia in little pigs is definitely associated with their being kept indoors, without access to earth. Adersen found that the disease could be cured or prevented by giving doses of iron direct to the little pigs, or more simply by allowing them access to soil, or by letting them run out of doors. Adersen's valuable work is now well known in this country, and it was through his investigations that anaemia of sucking pigs became recognized as a cause of the scour that occurs in pigs at about three weeks old. Prevention of anaemia has resulted in limiting outbreaks of scour, and has greatly reduced mortality in litters, in very many herds throughout the country.

From the practical point of view it has appeared sufficient to provide iron in medicinal form or through soil, or, in the case of pigs over three weeks old, to rely upon that contained in their trough feed. Experiments on rats, however, had shown that copper was required in addition to iron in order to prevent or cure the form of anaemia induced in young rats. Investigators of anaemia—Hart and Elvehjem—were at first of opinion that iron alone was sufficient, but their later experiments showed that iron in

* Nutrition Abstracts and Reviews, Vol. 3, No. 4.

NOTES ON FEEDING

conjunction with copper gave better results. Hamilton found that while copper alone had no effect on anaemia, commercial iron preparations containing some copper were more effective than pure iron, and more rapid improvement followed combined treatment with iron and copper. He recommended 25 mg. iron, in conjunction with 5 mg. copper per pig per day.

Our experience in dealing with anaemia in little pigs has been with commercial iron sulphate without the use of copper, and it is of interest to note that Professor Davidson's experience in treating nutritional anaemia in humans, indicates that the need for copper supplement is extremely improbable. It may be that the commercial iron preparations, commonly used for feeding to little pigs, contain all the copper that is necessary, but if unsatisfactory results should occur from the use of iron alone, pig breeders might try the dose on the lines of that recommended by Hamilton. In commercial herds, it has been found impracticable to give a daily dose of iron sulphate to each little pig, and it has become customary to allow the pigs access to soil, either in its natural state or containing 1 lb. of iron sulphate in 1 or 2 cwt. of fine soil. The addition of 3 or 4 oz. of copper sulphate to such a mixture should ensure an adequate supply of copper. The feeding of iron preparations to sows with the object of preventing anaemia in litters has not proved effective in the experiments that have been reviewed.

Anaemia does not ordinarily appear to occur in calves, lambs or foals, as it does in young pigs, but in various parts of the world anaemia affects farm stock on certain soils and under particular conditions, notably in New Zealand and Kenya. On the New Zealand pastures concerned, lambs are more susceptible than calves, and generally there appears to be direct relationship between growth and capacity to derive sufficient iron from the soil. The relatively slower-growing animal is more likely to absorb sufficient iron. Linseed, bran and molasses are found to be useful supplements to iron-deficient pasture, and help materially to keep stock healthy by preventing anaemia. This disease known as "pining" has been investigated in Tiree, and attributed to iron deficiency. The condition has been rectified by administering iron oxide to animals affected. Apart from this particular case, it does not appear that any specific investigations have been

NOTES ON FEEDING

made in the United Kingdom, showing that local diseases or inability to thrive may be due to iron-deficient pastures. Yet we know of instances in which young cattle and lambs fail to thrive on certain pastures, whereas older stock remain healthy, and it would seem that there may be scope for investigation to ascertain whether other pastures throughout the country may not be deficient in iron like those in Tiree, or like the "Bush-sick" land of New Zealand.

Vitamin E. —The importance and value of Vitamin E in promoting functional capacity in breeding animals has been referred to from time to time in these notes. The writer believes that the winter rations of sows and cows are occasionally deficient in this vitamin, and at Moulton good results have followed the use of a wheat germ product, appearing to indicate that it may act as a stimulant in this connexion, for winter use.

It is interesting to note that investigations made on the sex glands of rats that were fed on rations deficient in Vitamin E showed definite degenerative changes in the anterior pituitary similar to those found in castrated animals. The addition of Vitamin E to the diet, in the form of an extract of wheat germ, caused regeneration of the damaged tissue. The author* of the report of this investigation is of the opinion that Vitamin E is a controlling factor on the function of the pituitary gland and intimately affects the function of the ovary or the testis. The result of this investigation is in accordance with other experimental results obtained from the use of wheat germ oil as a source of Vitamin E. The results, however, would not necessarily be the same with cattle and pigs, and can hardly be accepted as evidence that the inclusion of wheat germ in the winter feed will promote breeding capacity.

Wheat v. Oats for Poultry.—In these notes for April last, the writer referred to the substitution of wheat meal for Sussex ground oats in a laying mash with satisfactory results. In this connexion it is interesting to note Weinmiller and Voight's report of an experiment on laying hens. Six strictly comparable groups each of 20 Leghorn hens were used for the experiment. As their grain ration, two groups received wheat, two had oats, and two oats that had been germinated for four days. The germinated oats gave slightly the highest egg yield, with wheat a very close second. The egg production from the ungerminated oats was, however, 15 per cent. less. Since the note for April was written, the price of wheat has hardened, but if after

* Gierbake, Göttingen.

NOTES ON FEEDING

harvest the price should fall, relatively to that of oats, poultry-keepers should find wheat economical for inclusion more widely in poultry rations.

A Supplement for Summer Grass.—In recent years authorities have pointed out that fresh young grass in May and June is very rich in protein—like “wet linseed cake” and it has been suggested that, from the point of view of chemical composition, the most suitable concentrated food to balance protein-rich grass is one high in carbohydrates. The old-established practice on the part of graziers was to feed undecorticated cotton cake on account of its astringent properties to correct the scouring tendency of strong grass. Undecorticated cotton cake, is, however, relatively high in protein, and still further upsets the balance by adding to the excess of protein. As a result of the newer knowledge of the composition of grass, various attempts were made to dispense with cotton cake and to replace it with a home-grown cereal, or maize or maize cubes. These trials, however, have not proved altogether satisfactory, as the carbohydrate-rich foods failed in themselves to counteract scouring. In the circumstances a compromise has proved of most practical value, and feeders find that a mixture of cotton cake and cereals, such as crushed oats, or barley, or maize, gives more satisfactory results than the use of one of these foods alone. It should be noted that it is advisable to avoid foods rich in oil, such as linseed cake, coconut cake and rice meal, for feeding to cattle on laxative grass. For summer feeding “extracted” meals are usually more suitable than the cakes that contain more oil.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu-rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro-tein equiv.
Wheat, British	£ 15	0 8	£ 7	72	1 2	0.62	9.8
Barley, British feeding	5 15	0 8	5 7	71	1 6	0.80	6.2
" Argentine	4 15	0 8	4 7	71	1 3	0.67	6.2
" Danubian	4 13	0 8	4 5	71	1 2	0.62	6.2
" Russian	4 15	0 8	4 7	71	1 3	0.67	6.2
Oats, English white	6 0	0 9	5 11	60	1 10	0.98	7.6
" black and grey	6 10	0 9	6 1	60	2 0	1.07	7.6
" Scotch White	6 17	0 9	6 8	60	2 2	1.16	7.6
" Canadian No. 2 Western	6 12	0 9	6 3	60	2 1	1.12	7.6
" mixed feed	5 5	0 9	4 16	60	1 7	0.85	7.6
" Argentine	6 7	0 9	5 18	60	2 0	1.07	7.6
" Chilean	6 0	0 9	5 11	60	1 10	0.98	7.6
" Russian	6 7	0 9	5 18	60	2 0	1.07	7.6
Maize, Argentine	4 18	0 7	4 11	78	1 2	0.62	7.6
" Danubian Gal. Fox	4 8†	0 7	4 1	78	1 0	0.54	7.6
" Russian	4 13†	0 7	4 6	78	1 1	0.58	7.6
Beans, English Winter	5 10‡	0 16	4 14	66	1 5	0.76	19.7
Peas, Indian	9 5†	0 14	8 11	66	2 7	1.38	19.7
" Japanese	18 12†	0 14	17 18	69	5 2	2.77	18.1
Dari	5 3	0 8	4 15	74	1 3	0.67	7.2
Milling offals—Bran, British	5 5	0 15	4 10	43	2 1	1.12	9.9
" broad	6 0	0 15	5 5	43	2 5	1.29	10
Middlings, fine imported	5 0	0 12	4 8	69	1 3	0.67	12.1
Weatings†	5 2	0 13	4 9	56	1 7	0.85	10.7
" Superfine†	6 2	0 12	5 10	69	1 7	0.85	12.1
Pollards, imported	4 12	0 14	3 18	62	1 3	0.67	11
Meal, barley	6 5	0 8	5 17	71	1 8	0.89	6.2
" grade II	5 10	0 8	5 2	71	1 5	0.76	6.2
" maize	6 0	0 7	5 13	78	1 5	0.76	7.6
" germ	6 0	0 11	5 9	79	1 5	0.76	8.5
" locust bean	7 0	0 5	6 15	71	1 11	1.03	3.6
" bean	7 15	0 16	6 19	66	2 1	1.12	19.7
" fish	16 0	2 1	13 19	59	4 9	2.54	53
Maize, cooked flaked	6 2	0 7	5 15	84	1 4	0.71	9.2
" gluten feed	5 15	0 12	5 3	76	1 4	0.71	19.2
Linseed cake, English, 12% oil	9 5	1 0	8 5	74	2 3	1.21	24.6
" " " 9% "	8 17	1 0	7 17	74	2 1	1.12	24.6
" " " 8% "	8 12	1 0	7 12	74	2 1	1.12	24.6
" " " 6% "	8 17‡	1 0	7 17	74	2 1	1.12	24.6
Soya-bean cake, 5½% oil	6 17‡	1 8	5 9	69	1 7	0.85	36.9
Cottonseed cake—English, Egyptian seed, 4½% oil	4 7	0 17	3 10	42	1 8	0.89	17.3
" " Egyptian, 4½% "	3 17	0 17	3 0	42	1 5	0.76	17.3
" " decorticated, 7% "	6 12†	1 8	5 4	68	1 6	0.80	34.7
" meal, decorticated, 7% "	6 10†	1 8	5 2	68	1 6	0.80	34.7
Coconut cake, 6% oil	6 0	0 18	5 2	77	1 4	0.71	16.4
Ground-nut cake, 6-7% oil	5 15*	0 18	4 17	57	1 8	0.89	27.3
" " " decor., 6-7% oil	6 15	1 7	5 8	73	1 6	0.80	41.3
" " " imported, decorticated, 6-7% oil	5 12	1 7	4 5	73	1 2	0.62	41.3
Palm-kernel cake, 4½-5½% oil	5 17†	0 12	5 5	73	1 5	0.76	16.9
" " meal, 4½% oil	5 17†	0 12	5 5	73	1 5	0.76	16.9
" " meal, 1-2% oil	5 5	0 12	4 13	71	1 4	0.71	16.5
Feeding treacle	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale	4 5	0 11	3 14	48	1 6	0.80	12.5
" " " porter	3 15	0 11	3 4	48	1 4	0.71	12.5
Dried sugar-beet pulp (s)	5 5	0 5	5 0	66	1 6	0.80	5.2

(a) Carriage paid in 4 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

† In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of April, 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1s. 2d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 7s. 6d.; P₂O₅, 2s. 1d.; K₂O, 3s. 8d.

FARM VALUES OF FEEDING STUFFS

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	4 14
Maize	78	7.6	4 13
Decorticated ground-nut cake ..	73	41.3	6 3
„ cotton cake ..	68	34.7	6 12

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.27 shillings, and per unit protein equivalent, 1.26 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1933, issue of the Ministry's JOURNAL, p. 784.)

FARM VALUES.

Crop	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£.s.
Wheat	72	9.6	5 4
Oats	60	7.6	4 6
Barley	71	6.2	4 18
Potatoes	18	0.8	1 4
Swedes	7	0.7	0 10
Mangolds	7	0.4	0 9
Beans	66	19.7	5 9
Good meadow hay	37	4.6	2 13
Good oat straw	20	0.9	1 7
Good clover hay	38	7.0	2 17
Vetch and oat silage	13	1.6	0 19
Barley straw	23	0.7	1 10
Wheat straw	13	0.1	0 17
Bean straw	23	1.7	1 11

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway W.C.2, price 6d. net.

MISCELLANEOUS NOTES

Inspection of Growing Crops of Potatoes

THE Ministry is now making arrangements for the inspection of this season's potato crops for the purpose of granting Purity Certificates for stocks that are found to be true to type and reasonably free from rogues. All growers in England and Wales who intend to sell seed potatoes are invited to apply for these Purity Certificates.

To facilitate the organization of the work of inspection, the Ministry asks growers to submit their applications as early as possible. It cannot guarantee that it will be able to carry out inspections if applications are received after June 21, in respect of early varieties, or after July 21 in respect of other varieties.

A fee of 2s. 6d. per acre, or part of an acre, is charged for inspection. Forms of application may be obtained from the Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

The Agricultural Index Number

THE general index number of the prices of agricultural produce for April at 111 was 3 points above that for March and 6 points higher than the index for April, 1933. Rises of 27 and 10 points respectively in the indices for milk and fat sheep were the factors responsible for the increase of 3 points in the general figure as compared with March, most other commodities showing lower index numbers.

Monthly index numbers of prices of Agricultural Produce.
(Corresponding months of 1911-13 = 100.)

<i>Month.</i>		1929.	1930.	1931.	1932.	1933.	1934.
January	.. ..	145	148	130	122	107	114
February	.. ..	144	144	126	117	106	112
March	.. ..	143	139	123	113	102	108
April	.. ..	146	137	123	117	105	111
May	.. ..	144	134	122	115	102	—
June	.. ..	140	131	123	111	100	—
July	.. ..	141	134	121	106	101	—
August	.. ..	152	135	121	105	105	—
September	.. ..	152	142	120	104	107	—
October	.. ..	142	129	113	100	107	—
November	.. ..	144	129	112	101	109	—
December	.. ..	143	126	117	103	110	—

MISCELLANEOUS NOTES

Grain.—Wheat again averaged 4s. 4d. per cwt. but as a slight rise occurred in the base period, the index fell one point to 57. If allowance is made for the "deficiency payment" under the Wheat Act, 1932, the index would be increased to approximately 132, the effect of which would be to raise the general index for agricultural produce from 111 to 117. Both barley and oats were cheaper, the former declining by 10d. to 7s. 11d. and the latter by 3d. to 5s. 11d. per cwt. and the relative index numbers were 8 and 3 points lower on the month at 103 and 84.

Live Stock.—Fat cattle continued to cheapen slightly during April, second quality averaging 34s. 7d. per live cwt. as against 34s. 9d. in March, whereas prices rose between March and April of the base period: the index therefore was reduced by 4 points to 95. On the other hand fat sheep, which have risen in price continuously since September last, showed a further advance of $\frac{1}{2}$ d. per lb. and the index at 128 was 10 points higher than a month earlier and 12 points higher than in April, 1933. Bacon pigs were 3d. and pork pigs 6d. per score lb. cheaper and the indices were reduced 2 and 5 points respectively to 125 and 126. Quotations for dairy cows appreciated by about 10s. per head and the index by 2 points to 103. The rise of 3s. per head in the average for store cattle, however, was proportionately less than that which occurred in April, 1911-13 and the index fell 2 points to 84. The upward trend in the values of fat sheep was reflected in the prices for store sheep, which sold at approximately 3s. 6d. per head more than in March. Store pigs declined in sympathy with values for baconers and porkers, the fall of 1s. 9d. per head causing a drop of 6 points in the index.

Dairy and Poultry Produce.—The average of the wholesale contract prices for sales of milk during April was 1 $\frac{1}{2}$ d. per gallon lower than in March but as prices fell 2 $\frac{1}{2}$ d. per gallon between March and April of the base period, the index rose by 27 points to 168. A year ago an advance of 24 points to 153 was recorded. Butter and eggs remained unaltered in price as compared with March, but since in both instances a fall occurred in the pre-war period, the indices moved upward by 7 and 10 points respectively to 91 and 99. Both fowls and ducks were slightly dearer, but proportionately greater increases occurred in April, 1911-13 and the index numbers were reduced; the combined index for poultry was 119 as compared with 126 for March.

MISCELLANEOUS NOTES

Other Commodities.—As is customary during April, potatoes became dearer but the average increase of 5s. per ton was proportionately less than in the base period and the index fell 8 points to 11 per cent. less than pre-war. The combined index for hay was one point lower at 80. Clover hay again realized slightly higher prices but meadow hay failed to make the usual advance and the index, therefore, was reduced 2 points. A further fall occurred in the average quotation for wool and the index at 96 compared with a figure of 98 a month earlier.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1932	1933	1934			
	April	April	Jan.	Feb.	Mar.	April
Wheat	79	68	59	60	58	57
Barley	101	82	117	113	111	103
Oats	105	81	80	91	87	84
Fat cattle...	118	100	106	103	99	95
„ sheep...	103	116	117	112	118	128
Bacon pigs ...	100	112	125	129	127	125
Pork „	109	116	136	135	131	126
Dairy cows ...	119	106	105	101	101	103
Store cattle ...	115	99	90	92	86	84
„ sheep	89	84	93	91	91	95
„ pigs	104	123	163	159	143	137
Eggs	107	93	97	95	89	99
Poultry	127	124	115	118	126	119
Milk	150	153	166	161	141	168
Butter	111	91	92	86	84	91
Cheese	139	111	114	115	116	117
Potatoes	239	87	104	100	97	89
Hay	68	66	79	79	81	80
Wool	69	62	95	100	98	96

Revised index numbers due to Wheat Act payments.

Wheat	—	129	136	135	135	132
General Index	—	109	119	117	113	117

Register of Dairy Cattle

VOLUME XVII of the Register of Dairy Cattle has just been published. It contains particulars of 680 cows in respect of which Certificates of Merit have been awarded by the Ministry since October 1, 1933. This compares with 553 cows entered in the previous Volume. To be eligible

MISCELLANEOUS NOTES

for a Certificate of Merit, a cow must have given, during a period of three consecutive Milk Recording Years, not less than the prescribed yield of milk, and must normally have calved not less than three times during those years. The prescribed yields for the three-year periods are 30,000 lb. for Friesians; 27,000 lb. for Ayrshires, Blue Albions, Lincoln Red Shorthorns, Red Polls and Shorthorns; 24,000 lb. for all other breeds or types except Dexters; and 21,000 lb. for Dexters.

A statement is given showing the number and distribution of the yields of the cows of the various breeds entered in the Register, and the highest yield certified for each breed for the three years ended October 1, 1933. Of these cows, 12 gave over 50,000 lb. of milk during the three years concerned; 65 over 40,000 and under 50,000 lb.; 107 over 35,000 and under 40,000 lb.; 204 between 30,000 and 35,000 lb.; 190 between 27,000 and 30,000 lb.; 60 between 24,000 and 27,000 lb.; and 3 between 21,000 and 24,000 lb.

Particulars are also given of pedigree bulls of proved milking strain. The condition of entry of a bull in the Register is that its dam and sire's dam have given the standard yield prescribed for their breed or type in any particular Milk Recording Year. Entries relating to 12 bulls are given in the Volume.

A list of the Milk Recording Societies of England and Wales, with particulars of each Society and the name and address of its Secretary, is included in the Register.

Dairy farmers and others desirous of acquiring high-yielding, milk-recorded cows that have been regular breeders should find the Register a valuable book of reference.

The Register is priced 1s. net, and can be obtained from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, or through any bookseller. A copy of the Volume is issued free to all members of Milk Recording Societies.

Importation of Cherries

WITH the object of preventing the introduction of the Cherry Fruit Fly, the Minister of Agriculture and Fisheries has made an Order under the Destructive Insects and Pests Acts, 1877 to 1927, regulating the importation of cherries into England and Wales during the 1934 season.

Cherries grown in *Spain* and *France* were admitted without restriction until May 27, after which date

MISCELLANEOUS NOTES

importation was prohibited except of French cherries grown within a small district around Honfleur. Details of this district are given in the Order.

Cherries grown in *Italy* will be admitted until June 12, if accompanied by a certificate of origin, after that date only those grown in the Region of Emilia will be allowed to enter; after June 23, the importation of cherries grown in any part of Italy will be entirely prohibited.

Cherries grown in *Germany* will be admitted until June 26, if accompanied by a certificate of origin; after that date no German cherries will be admitted except those certified not to have been grown south of latitude 53° N. or in East Prussia.

Certificates of origin must accompany cherries grown in any other European country which are imported after May 27.

Copies of the Order may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1d., post free 1½d.

Certified Stocks of Strawberries and Black Currants

WITH increased home plantings of strawberries and other soft fruits, consequent on the imposition of duties on imported soft fruit, it is necessary to emphasize again the desirability of planting only stocks that are healthy, vigorous and true to type.

The Ministry facilitates the provision of reliable stocks by issuing, each year, Registers of Growers whose stocks of strawberry plants and black currants have been examined during the growing season, and found to be true to name and reasonably free from rogues. Certificates issued in respect of these stocks do not imply freedom from disease, but a certificate is not issued in respect of a stock that, at the time of inspection, is obviously unhealthy or lacking in vigour.

Arrangements are now being made for the inspections of stocks during the coming season; and growers who wish their stocks to be entered in the Registers should apply, for forms of application and explanatory memoranda, to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1. Applications for inspection must reach the Ministry not later than June 23, 1934.

MISCELLANEOUS NOTES

Export of Breeding Stock

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland during the three months ended March, 1934, compared with the corresponding period of 1933. (From returns supplied by H.M. Customs and Excise.)

	Jan. to March, 1934		Jan to March, 1933	
	Number	Declared Value	Number	Declared Value
CATTLE				
Argentina	49	£ 8,130	0	£ 0
Brazil	5	671	0	0
Uruguay	10	960	0	0
Australia	31	5,516	16	1,547
Canada	7	275	4	400
Irish Free State	43	1,265	89	2,219
Kenya	8	400	6	236
New Zealand	1	135	0	0
Southern Rhodesia	2	315	0	0
Union of South Africa	7	479	3	485
Other countries	2	132	3	301
Total	165	18,278	121	5,188
SHEEP AND LAMBS				
Argentina	37	755	0	0
Belgium	4	34	6	48
Brazil	15	550	36	900
France	2	32	4	50
Peru	20	420	0	0
Uruguay	14	350	0	0
Australia	2	70	1	60
Canada	14	60	16	480
Kenya	0	0	3	189
Union of South Africa	22	213	10	45
Other countries	0	0	0	0
Total	130	2,484	76	1,772
SWINE				
Belgium	4	59	1	15
France	4	38	4	57
Italy	3	55	0	0
Japan	0	0	6	289
Poland	0	0	7	105
Spain	12	147	0	0
Yugoslavia	2	25	0	0
Australia	2	85	3	63
Irish Free State	2	12	0	0
Malta and Gozo	10	175	0	0
Other countries	1	16	4	50
Total	40	612	25	579

MISCELLANEOUS NOTES

The International Yearbook of Agricultural Statistics

THE International Institute of Agriculture at Rome has recently published the 1932-33 edition of the International Yearbook of Agricultural Statistics. This volume of about 800 pages is the result of the most extensive and detailed inquiry made in the domain of international agricultural statistics, and constitutes a work of the greatest importance to all those who are interested in questions having a direct or indirect relation to agricultural production and trade.

Area and population figures of 208 countries, in the years nearest to 1928 and 1932, are classified in the first part of the Yearbook. The presentation of these figures throws light upon the world situation, from the geographical and political points of view, during the post-war period. The second part of the Yearbook is composed of a series of tables comprising, for nearly 50 countries, the available data concerning the uses for which the total area is employed, the apportionment of cultivated areas between the different crops, agricultural production, numbers of the different kinds of live stock and the products derived from them. In the tables, constituting the third part of the volume, the area, production and yield, per acre, in each country, during each of the years from 1929 to 1932, and the average of the five years ended 1928, are given for nearly 40 agricultural products.

For each kind of live stock, all available figures in the different countries have been grouped for the years 1928 to 1932. A large part of the volume is devoted to statistics of the commercial movement of 43 vegetable products and 13 products of animal origin. The figures published relate to the imports and exports during the calendar years, and for the cereals, also, during the commercial seasons. It may be added that the tables of production and commerce not only specify details for each country, but also the totals for the different continents and hemispheres, and for the whole world, giving a general idea of the changes taking place, during the periods under consideration, in the area under each crop, quantities harvested and the commercial movement in each product.

The part devoted to prices contains the weekly quotations of 40 agricultural products on the principal world markets for the period January, 1928, to July, 1933. In the freights section will be found the quotations for the transport of wheat, maize and rice on the most important

MISCELLANEOUS NOTES

shipping routes; in the section reserved for fertilizers and chemical products useful in agriculture are published statistics of production, trade, consumption and prices for 15 products; and in the Appendix have been included special chapters on the distribution of agricultural holdings according to their size and mode of tenure.

Copies of the latest volume may be purchased direct from the International Institute of Agriculture, Villa Umberto I, Rome, Italy, price 90 liras.

Summer Demonstrations at Rothamsted and Woburn

SIR JOHN RUSSELL, Director of the Rothamsted Experimental Station, again extends a cordial invitation to farmers and other interested persons to inspect the Rothamsted and Woburn plots at any convenient date from now up till the end of October. Mr. H. V. Garner and Captain E. H. Gregory will act as guides, and even if weather conditions preclude a close inspection of the fields a profitable time may be spent in the demonstration hall at Rothamsted.

At Woburn, where the soil is light, the classical fields are now in their 55th season, and in addition there are modern experiments in progress on potatoes, barley, sugar beet, kale and permanent grass.

The soil at Rothamsted is a heavy loam. The classical fields there are in their 81st year, and form a unique demonstration of the effects of fertilizers on barley, wheat, mangolds and meadow hay. Farmers who are confronted with manurial and cultivation difficulties consequent on mechanized cereal farming will be specially interested in the continuous growing of wheat on Broadbalk field. Modern fertilizer and cultivation problems connected with the manuring of potatoes, sugar beet, barley, kale, fodder crops and permanent grass, are being investigated by the new field technique that has been developed at the Station. There are also experiments dealing with poultry manure, the effects of bare fallowing, rotary cultivation, and rotation tests for various methods of returning cereal straw to the soil. Good types of implements are on view, and a complete electric installation has recently been added.

It is not possible to visit both farms in one day, but either will afford ample interest for a full day's visit. All communications and requests to visit the Stations should be addressed to the Secretary, Rothamsted Experimental

MISCELLANEOUS NOTES

Station, Harpenden. It would be a convenience if ample notice could be given so as to avoid the possibility of dates clashing.

The National Diploma in Agriculture and the Fream Memorial Prize

THE thirty-fifth annual examination for the National Diploma in Agriculture was held, under the auspices of the National Agricultural Examination Board, at the University of Leeds from April 12 to 19, 1934, when 127 candidates presented themselves. Of these, 7 took the whole examination; 67, having already passed in certain subjects, appeared to take the remainder; and the other 53 came up for a first group of subjects.

The diploma was awarded to 42 candidates (all men), of whom one, Mr. W. A. Buckpitt, from the Seale-Hayne Agricultural College, Newton Abbot, Devon, obtained honours. In the examination in a first group of subjects, 30 candidates (including one woman) were successful, and are, therefore, entitled to take the remaining subjects in either 1935 or 1936. The training colleges of the successful candidates were as follows:—

	<i>Diploma</i>	<i>First group of subjects.</i>
Armstrong College, Newcastle	3	2
East Anglian Inst. of Agric., Chelmsford ..	1	1
Harper Adams Agric. Coll., Newport, Salop..	6	1
Leeds University	5	3
Midland Agric. Coll., Sutton Bonington ..	6	4
Reading University	1	1
Royal Agric. Coll., Cirencester	1	—
Seale-Hayne Agric. Coll., Newton Abbot ..	3	3
South-eastern Agric. Coll., Wye, Kent ..	5	2
England (non-collegiate)	—	1
University Coll. of Wales, Aberystwyth ..	2	2
Wales (non-collegiate)	—	1
Aberdeen University and North of Scotland Coll. of Agric.	1	—
Edinburgh and East of Scotland Coll. of Agric.	1	—
Glasgow University and West of Scotland Agric. College	3	6
West of Scotland Agric. Coll., Glasgow ..	3	3
Northern Ireland (non-collegiate)	1	—
	42	30

The Fream Memorial Prize, awarded to the candidate obtaining the highest marks in the examination, was secured by Mr. W. A. Buckpitt, who, as mentioned above, obtained the Diploma with Honours. The Prize, of an approximate

MISCELLANEOUS NOTES

value, this year, of £7, is provided from a fund entrusted to the Ministry as a memorial to the late Dr. Fream; and is applied to the purchase of books selected by the recipient as best calculated to assist him in pursuing his agricultural studies.

Farm Crop Variety Trials.—A cordial invitation to visit the National Institute of Agricultural Botany during the summer months is extended to all who are interested in agriculture. Choice of the right variety of the right crop is of vital importance to farmers; though it costs no more and sometimes less to grow the right variety than the wrong one, there may be as much as twenty per cent. difference between the returns secured. Farmers who want to assure themselves that they are growing the right varieties of cereals, sugar beet, roots and other crops cannot do better than go to see the trials at Cambridge or one of the other centres—Sprowston (Norfolk), Good Easter (Essex), Long Sutton (Hants), Cannington (Somerset), and Newport (Salop). There they will find all the leading varieties growing side by side, including the latest introductions and others that are likely to reach the market in the near future. July is the best month. Visitors are welcome either singly or in parties, but arrangements should be made beforehand by writing to the Secretary, National Institute of Agricultural Botany, Huntingdon Road, Cambridge.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at 7, Whitehall Place, London, S.W.1, on May 17, 1934, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders.

Dorset.—An Order continuing the operation of the existing minimum and overtime rates of wages from June 10, 1934 (i.e., the day following that on which the existing rates are due to expire), until December 8, 1934. The minimum rates are:—

(1) For male workers of 21 years of age and over 30s. per week of 53½ hours in summer, except in the week in which August Bank Holiday falls, when the hours are 44, and 48 hours in any week in winter.

(2) For female workers of 21 years of age and over (other than part-time or casual workers), 24s. per week of 48 hours except in the week in which August Bank Holiday falls, when the hours are 39½, with, in addition in both cases not more than 3 hours on August Bank Holiday on work in connexion with milking and the care of and attendance upon stock, and

(3) For part-time or casual female workers of 18 years of age and over, 5d. per hour.

The overtime rates are 8d. per hour for male workers of 21 years of age and over (except that for overtime employment during the hay and corn harvests the rate is 9d. per hour) and 6d. per hour for all classes of female workers of 20 years of age and over.

Hampshire and Isle of Wight.—An Order fixing special differential rates of wages for overtime employment of male workers on the corn harvest in 1934, the rate for workers of 21 years of age and over being 9d. per hour.

Hertfordshire.—An Order fixing special overtime rates of wages, for employment during the hay harvest of 1934, to apply to all employment on harvest work after 5.30 p.m. (legal summer time) on each day of the week. The overtime rates for male workers of 21 years of age and over is 10d. per hour, and for female workers of 19 years of age and over 7½d. per hour.

APPOINTMENTS

Enforcement of Minimum Rates of Wages.—During the month ending May 14, legal proceedings were taken against eleven employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.	Court.	Fines imposed.			Costs allowed.			Arrears of wages ordered.			No. of workers involved.
		£	s.	d.	£	s.	d.	£	s.	d.	
Cheshire	Crewe	10	0	0	2	2	0	9	15	6	2
Monmouth	Pentonville	1	0	0	2	6		4	18	7	1
Norfolk	Loddon	1	0	0	11	6		4	7	0	2
do.	Terrington	1	0	0	—			10	0	0	1
	St. Clement										
Yorks, N.R.	Northallerton	2	0	0	2	6		11	13	10	1
do. W.R.	Bradford	2	0	0	2	2	0	25	0	0	1
Carmarthen	Llanfihangel	10	0		2	6		36	4	10	1
	ar Arth										
do.	Whitland	10	0		—			15	0	0	1
Glamorgan	Penmaen	1	0	0	2	2	0	46	16	11	2
do.	Ystrad	*			—			—			1
Pembroke & Cardigan	Talybont	5	0		—			2	4	0	1
		£19	5	0	£7	5	0	£166	0	8	14

* Case dismissed.

APPOINTMENTS

County Agricultural Education Staffs

ENGLAND

Hertfordshire.—Mr. J. W. Reid, N.D.A., F.A.C., Senior Agricultural Lecturer, has been appointed Vice-Principal of the Institute of Agriculture, *vice* Mr. C. E. Hudson, N.D.H., F.R.H.S.

Mr. E. R. Saltmarsh, N.D.H., C.D.H., has been appointed Horticultural Lecturer, *vice* Mr. C. E. Hudson, N.D.H., F.R.H.S.

Mr. G. H. Tawell has been appointed Assistant Horticultural Lecturer, *vice* Mr. E. R. Saltmarsh, N.D.H., C.D.H.

Cambridgeshire.—Mr. K. V. Cramp, R.H.S.Dip., has been appointed Horticultural Instructor and Adviser, *vice* Mr. A. T. Paskett (deceased).

Mr. L. P. Clift, N.D.H., has been appointed Assistant Horticultural Instructor, *vice* Mr. K. V. Cramp, R.H.S.Dip.

Mr. F. A. Pearson, B.Sc., has been appointed Assistant Instructor in Agriculture, *vice* Mr. G. W. Channon, N.D.A., N.D.D., B.D.F.D.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 4 July, 1934

NOTES FOR THE MONTH

Drought

FARMERS are so accustomed to the vagaries of the weather that they regard a dry year, now and again, with equanimity. Drought as we have known it, accompanied by bright sunshine, is preferred to dull showery weather. Abundant sunshine means thriving flocks and herds, and crops of good quality garnered with the minimum of expense. A shortage of hay or straw can be made good from the carry-over of the previous year. When, however, a dry summer is succeeded by a dry winter and an even drier summer, hay is then in short supply and the farming business generally is apt to be thrown out of gear. Relatively, the pastoral or stock farmer is more hardly hit than the arable farmer. In the autumn following a dry summer, the markets are glutted with store or half-fat animals that nobody wants. If such stock are carried through the winter on the food-stuffs or fodder that the grazier feels able to provide, his pastures are so hardly bitten that the usual spring "flush" is slow in coming and, in a year like the present, may fail altogether. For lack of grass, stock are again rushed to market and prices are still further depressed.

All pastoral farmers are the better for having a portion of arable, if only because of its greater versatility. In the driest districts of England, namely the Chalk, one crop that revels in drought, to wit lucerne, can be grown to perfection. It cannot be grazed, but it can be soiled and made into hay twice or thrice in a season. In the southern counties permanent grass is not generally reliable enough as the sole source of hay, and it is not sufficiently healthy for sheep. Apart altogether from the question of drought, arable grazing is becoming indispensable, for the progressive stock farmer. If "maiden" seeds should fail, as they well may this year, there will still be an opportunity for re-sowing in the autumn. At little expense for seed or labour a mixture of Italian rye grass, and trefoil may be

NOTES FOR THE MONTH

drilled on autumn stubbles, with a reasonable prospect of providing hay or grazing next year. A combination of rye and rape sown separately in early August might also prove an inexpensive source of early spring keep. Stubble turnips are another possibility.

It sometimes happens that a dry summer is succeeded by a mild and moist autumn. In such an event, stock may be able, till nigh on Christmas, to find a large part of their food out-of-doors. Even if grass land were yet to freshen abundantly, there may not be a favourable opportunity for late haymaking. The possibility, however, of grass ensilage should not be overlooked. Grass makes good silage, better than lucerne or clover aftermath, and as, in many instances, it would have to be ensiled in clamp form, a word on the method may not be out of place. A free-draining site should be excavated to a depth of 1 to 2 ft. $\times$ 12 ft. wide at the bottom, bevelled to 14 ft. wide at the top. The length will depend on the quantity of grass to be ensiled. For carting over, after the fashion of a drawn-up dung heap, a suitable length is 21 ft. Carted over to the limit of safety as regards height, such a heap should contain about 25 tons of silage. After filling to a thickness of about 3 ft., an interval of a day or two should be allowed to elapse for fermentation and settling, after which the carting may proceed steadily. The sides of the heap from the surface of the ground upwards should incline inwards and the top should be slightly rounded. Two long poles, one on each side, should be slung along the eaves, being held in position by transverse wires, and the space between, forming the roof, should be immediately covered with about 1 ft. of the excavated soil. To protect the silage from dirt and rain, sheets of corrugated iron may be laid along the top before the soil is thrown up. The poles will prevent the soil from slipping. The sides need not be covered.

Agricultural Research

IN these days, when public agricultural opinion is so much occupied with questions relating to prices and markets, work that is unobtrusively in progress at agricultural research institutions is apt to be overlooked, or at least regarded as of decidedly secondary importance. It may be true that the world is suffering from over-production of certain commodities rather than from the reverse, and to that extent the efforts of science to remove the disabilities attaching to

NOTES FOR THE MONTH

agricultural production may be regarded as of less importance than efforts to recreate or rejuvenate markets for the sale of agricultural produce.

On the other hand, a period of continued low prices is one in which the farmer is peculiarly concerned to take all possible steps to produce his goods at the least cost, and viewed in this light the prosecution of research into the problems of farming is as important as ever.

It can fairly be claimed that the value of agricultural research is cumulative, and that as the years pass the work of the research institutes that have been established in this country progressively increases in proportion to the funds that are required to maintain them. Each year, advances are being made that are of enormous potential value to the agricultural industry. As typical examples, chosen almost at random, it may be said that cereal growing has been profoundly affected by the introduction some years ago of Yeoman wheat and Spratt Archer barley, and that the practical methods of fruit growers have been radically changed as a result of the work of the research stations at East Malling and Long Ashton. Crop diseases, also, are continually being brought under more effective control.

The programme of work at all research centres is reviewed each year by the Ministry in conjunction with the Agricultural Research Council—a body established comparatively recently, composed partly of scientific and partly of practical men—and already the result of this friendly review has been to secure a greater measure of co-ordination in the work of the various branches of research. The grants required by the various Institutions for the forthcoming academic year are at present under consideration by the Ministry in consultation with the Council, as a preliminary to applying for the necessary moneys from the Development Fund. The financial position still calls for rigid economy of expenditure, but mainly as the result of funds at the disposal of the Agricultural Research Council, some extension has been possible in a direction of considerable urgency, namely, the investigation of live-stock diseases.

The Rothamsted Holdings

As recently as April there was published in this JOURNAL (p. 7), an appeal for £30,000 to enable the Rothamsted Experimental Station to purchase the holdings on which the famous experimental work, inaugurated a century ago

NOTES FOR THE MONTH

by Sir John Lawes, has been carried out, and thus provide for continuity of research. Most happily the appeal, supported and made known by the Press throughout the country, received a quick response from a large number of those—individuals, societies and trade interests alike—who are devoted to the cause of agricultural prosperity. Sir John Russell has therefore been able to announce that the large number of contributions, from the humble half-crown of the well-wisher to gifts running into thousands of pounds, had reached—to June 16—a total of £35,054, against a total expenditure of £35,270. The Station is therefore assured of possession of its experimental farm, including the "classical" plots of wheat and other crops that have long been world-famous.

The occasion of possession was celebrated on June 20, when a large gathering of farmers, and many others interested in the great industry of agriculture, as well as representatives of foreign countries, met at Rothamsted, and Mr. Walter Elliot, the Minister of Agriculture, formally handed over the deeds to Lord Clinton, who accepted them on behalf of the Trustees. This was indeed a momentous day in the history of Rothamsted.

The Minister, accompanied by Sir C. J. Howell Thomas, Permanent Secretary of the Ministry of Agriculture, and Sir John Russell, Director of the Rothamsted Experimental Station, inspected the experimental field plots and the laboratories, and members of the staff of the Station devoted themselves whole-heartedly to visitors, to whom they tirelessly expounded the nature of the work that has been done and is in progress.

At an informal luncheon in a large marquee, Lord Clinton, Chairman of the Trustees, who presided, observed that the work Mr. Elliot had done on the marketing side of agriculture had created a new hope in the minds of agriculturists. Referring to the purchase of the Rothamsted land, he said it was not always to the advantage of a tenant farmer to become his own landlord; but there came a time when estates had to be sold and then the tenant had to consider what his position was to be. If they had not got possession of Rothamsted they would not only have lost the home that had been theirs for some 90 years, but they would have lost records of incalculable value.

Sir John Russell expressed his very warm thanks for the wonderful response to his appeal. He referred to the



Inspecting the Rothamsted Wheat Plots

Left Sir John Russell, Mr. Walter Elliot, and Sir C. J. Howell, Thomas
Right Frost, and Professor H. E. Armstrong



[Photos H. C. Long

The Rothamsted Wheat Plots

NOTES FOR THE MONTH

world-wide interest taken in the Rothamsted Experimental Station, and said that its purpose was not to teach farmers how to farm but to give them information that could be used in solving their own problems on their farms. They counted the Minister of Agriculture as one of themselves, and if Mr. Elliot lost his job at the Ministry they would consider taking him on the staff at Rothamsted (laughter). They congratulated Mr. Elliot on the whole-hearted sincerity with which he was tackling agricultural problems.

Mr. Elliot, before handing over the deeds to Lord Clinton, said it was always an important day in the history of any man when he ceased to be a tenant and became a laird. The atmosphere of close contact with the soil at Rothamsted went back so long that it would have been a crime not only to the agriculture of this country but to the agriculture of all countries, if that contact had been broken. Very few places had continuous records of the same piece of land for 80 or 90 years, and when these records at Rothamsted existed it was vital that they should be continued. The recorded memory which Rothamsted represented was perhaps one of the most important things in all agriculture, and to have reduced Rothamsted to lawn-tennis courts and villas would have been a crime against agricultural England.

He described Sir John Russell as a portent among scientific men: a man who could secure that scientists lay down in harmony together. That was not as easy as they might think from all they heard about the noble work of science.

It was true that great farming had been done and was being done in England, which was a place suitable for the production of many crops in a way that could not be surpassed in any other part of the world. It was that, among other things, that made them so happy to feel that the Station would continue; that the memory of Lawes would not be forgotten and that the Trust would be remembered at the place where it started.

It was an historic thing they were doing; they were at the change-over from an old estate which since 1600 to the present had been in the possession of one family. It was a pity when such a long tradition was broken; they must see that the new tradition now started would be as great and fruitful, and if they produced as great results for agriculture and England as the association of the Lawes family with the soil had done in the past the work of the donors would not be in vain.

NOTES FOR THE MONTH

Lord Clinton then accepted the deeds on behalf of the Trustees.

Professor H. E. Armstrong, a member of the Trust Committee, expressed thanks to Mr. Elliot, and said that no clear idea of the vast importance of the Rothamsted Station was yet before the public. In the distant future when Mr. Elliot reviewed his career he would regard that occasion as probably the most momentous in the course of his official career, coupled as it was with the action he had taken on behalf of the organization of agriculture. He had done far more than attempt to organize the production of, say, milk; he had begun to put the industry in order. There was before them at the moment the greatest struggle the world had witnessed in modern times—the struggle between industry, so called, and agriculture. This country had to make up its mind whether or not it was going forward on a basis of agricultural industry and not on the basis of commercial industry. For that purpose Rothamsted Station was bound to play a great part.

In no other place in the world had such experimental work been carried on for 90 years under close observation and most careful records kept of everything that had happened. The Rothamsted work hitherto had been almost entirely statistical. They had learned what the plant needed; they had learned little as yet what it could produce. Quality had scarcely been tested.

Farm and Machine

To workaday folk, apt to think of a Research Institute as a centre devoted to abstruse scientific investigation, the first number of *Farm and Machine** will come as an agreeable surprise. The description given of the general activities of the Institute for Research in Agricultural Engineering at Oxford, all bearing directly on problems of the modern farm, supplemented by short bulletins on different phases of the Institute's work, will prove of general interest not only to farmers but also to engineers, manufacturers and traders.

Some idea of the nature and scope of the work will be gathered from the fact that, in addition to laboratories and

* *Farm and Machine*, Vol. I, Report of the Institute for Research in Agricultural Machinery, University of Oxford, for the year ended September, 1933, and miscellaneous papers on agricultural engineering. Oxford: The University Press, price 2s. 6d., or 2s. 8d. from the Institute.

NOTES FOR THE MONTH

workshops, the Institute runs its own field station, and has access, for observation and the securing of experimental data, to 5 farms in its immediate vicinity. A survey of 14 mechanized farms is being conducted along observational lines. This aims at studying, recording and furthering the adaptation to English conditions of methods already widely practised overseas. In co-operation with the Norfolk Experiment Station, three types of spacing drills have been studied in addition to equipment designed for root crop cultivation. Work has been carried out with a combine hay baler, and a tractor-operated power stacker has been constructed for testing this year.

The Institute is not concerned directly with the invention of new machines, but rather with the encouragement of inventors. In this connexion, the Institute undertakes official tests of new machinery, the results of which are published; also confidential tests for manufacturers, with the object of supplying private information on the performance of machines under development.

Of the contributed articles, one, by the Assistant Director of the Institute, Dr. S. J. Wright, deals with "Tractor Developments in 1933." Perhaps the most interesting part of this essay is that dealing with the comparative running costs of paraffin and crude oil tractors, in which the author sets out the position more clearly than has previously been done, and removes what is, perhaps, a common misconception on the point. He indicates that not only is the range of tractors being widened, but the availability of different types is increasing, particularly as regards the tractive method, which has been amplified by the introduction of the pneumatic tyre. Data are provided regarding the relative merits of steel wheels, creeper-tracks and low-pressure pneumatic tyres. The use of the last on farm carts also forms the subject of a separate article, which clearly details the circumstances in which these tyres are an advantage.

Collateral with the article on Tractors is that discussing "Engines for Farm Work." This article, by Mr. E. B. Black, deals with the advantages and disadvantages of stationary petrol, paraffin and Diesel engines, as well as the present small application of electricity to this class of work, mainly because of the high cost of current and the small number of farms at which a supply is available. Power at present, therefore, must be provided chiefly by the first three types, and it is suggested that the Diesel is

NOTES FOR THE MONTH

likely to be the engine of the immediate future, always provided that there is no material change in fuel prices. The range of application, too, is likely to extend with the fitting of auxiliary power units to machines ordinarily horse-drawn, as, for example, mowers, while pumping is another increasing field for engine power. The subject of electricity on the farm is discussed in an essay by Mr. Cameron Brown.

Haymaking and harvesting machinery, including the combine harvester, are described by Mr. H. W. Cashmore. An example of mechanized farm technique is provided in a description, by Professor J. A. Scott Watson, of the work at present being conducted by St. John's College at their farm at Long Wittenham.

Other contributions include "Sulphuric Acid Spraying in 1933," a process that has definitely emerged from the experimental stage; a discussion of "Alternatives to Mole Draining," largely based on continental practice but including a description of the British tile ram; a useful note on "Drought"; and a list of the world's Agricultural Engineering Research Institutes.

Some Impressions of British Farming

THE concluding article of the series, by Professor J. A. Scott Watson, under the above title, which was announced to appear in this issue of the JOURNAL, has had, unavoidably, to be held over. It is hoped, however, to include it in the August number.

Midland College Farm Engineering Course

A THREE-WEEKS' course, dealing principally with small internal combustion engines and agricultural tractors, will be held at the Midland Agricultural College, Sutton Bonington, Loughborough, commencing Monday, August 20, 1934. In addition to the main items of the syllabus, mentioned above, instruction will be given on standard overhauls and maintenance, elementary workshop practice and tractor driving. Lectures will also be given to cover the theory required for the practical work. The fee for the course, including board, lodging and instruction, will be £2 12s. 6d. per week for those resident within the College area, and £3 10s. 0d. per week for those outside. Further particulars can be obtained on application to the Principal of the College, as above.

PALATABILITY AND THE MANAGEMENT OF THE POORER GRASS LANDS

Professor R. G. STAPLEDON, C.B.E., M.A.,
Welsh Plant Breeding Station, Aberystwyth.

DURING the past ten years a great deal of work relating to palatability has been conducted at the Welsh Plant Breeding Station. It is not the intention of this article to review the work in any detail, but to outline some of the more recent results that have been obtained, and to discuss their bearing upon the proper management of the poorer types of grass land.

Because different swards, different parts of the same sward, and the different species contributing to swards, vary in palatability, the animals grazing upon them display selectivity in their grazing. The effects of this selectivity are profound and far-reaching, both on the animals and on the type and therefore the quality of the sward.

Selective grazing can take two forms. The animals may either graze certain species much harder than others, throughout the whole of a field, or they may concentrate on portions of a field and closely defoliate the patches to which they are attracted, with the minimum of interspecific selection. Only the latter type of selection will be dealt with in this article.

The Selection of Areas within an Enclosure.—The selective grazing of patches within an enclosure, although one of the most striking features connected with grass land, has never been sufficiently studied. Recent critical work conducted by Milton,^{1*} as well as further observations made in conjunction with our large-scale experiments on the improvement of hill land, have, however, emphasized a number of important points. This selection of areas, as opposed to the selection of individual species, is influenced by (1) botanical composition; (2) fertility; and (3) lack of mature burned or dried herbage and of inflorescences. We have accumulated a considerable amount of experimental evidence relative to these three factors. There are, of course, other factors, of which soil moisture is the most obvious, but with these we are not at present concerned.

* For references, see page 328.

MANAGEMENT OF THE POOKER GRASS LANDS

(1) *The Effect of Botanical Composition.*—Milton has shown that, if animals have access to a number of different seeds mixtures on one and the same field, they will tend rather to select a mixture as such than to select a particular species from a number of different mixtures. Timothy, which all our work has shown to be the most palatable of the grasses, when present in reasonable amount in a mixture, serves to attract animals to such a mixture. All contributing species to such a mixture will be well grazed, whereas they may be neglected when they occur in mixtures from which timothy has been excluded. In a mixture, Cocksfoot—if not allowed to grow tall and coarse—is more attractive as a component than perennial rye-grass, but of course when included in the mixture for a whole field, or for the large proportion of a field, the cocksfoot tends to grow away, and by that much will render the whole field, or large areas of the field, relatively unpalatable. The ability to remain long in a palatable condition is perhaps the outstanding merit of perennial rye-grass, a merit that it shares with white clover.

Red clover and white clover are exceedingly palatable if neither contributes to the herbage on a field to the almost total exclusion of everything else. These two clovers in mixtures do not, however, appear to exert the same attraction to a particular area as timothy. Where white clover is present in fair amount throughout a field, its greater abundance on particular patches will not necessarily lead to closer grazing.

When, however, white clover is induced to grow in patches on a field otherwise devoid of clover, or where it was only sparsely present, such patches are likely to be very closely grazed compared with the rest of the field. An excellent example of this was afforded on a paddock, on the foothills of Plynlymon, which some years previously had been slagged by Captain Bennett Evans. Since there was no white clover on the paddock, the slag had been without effect in so far as legumes were concerned. In August, 1931, Captain Bennett Evans marked out large initials, R. G. S. (those of the writer) on the paddock and sowed white clover over them. During the next summer (1932), and to everybody's surprise, the R. G. S. stood out prominently for all to see from the opposite hillside. The initials had become highly clovery—but it was not the clover as such that showed them up. The sheep grazing

MANAGEMENT OF THE POORER GRASS LANDS

the paddock as they crossed the initials clipped them bare, taking alike clover, bent and fescue; it was as if a lawn mower had been run several times over the initials. The clovery herbage as a unit had been grazed anything up to about 20 times as hard as the rest of the paddock. The initials showed up again during the summer of 1933, and afford an outstanding example of how animals may be attracted to and retained upon particular areas.

(2) *The Effect of Fertility*.—The application of manures affects palatability in two distinct ways. In the first place, the manures may exert an influence on the botanical composition. Thus, lime or phosphates or potash may be instrumental in causing a great increase in wild white clover, so great an increase that the whole of large areas will be far better grazed than formerly. By sowing seeds as well as manuring, not only can white clover be made to grow where before there was none, but valuable grasses can also be introduced. In 1931, at Lletyevanhen, nearly 1,000 ft. above sea level, we made a strip of one harrow's width for nearly a mile right across the open sheep walk. This strip traversed bent-fescue pasture, *Molinia* pasture and other types of hill grazing. Various manurial dressings were put down and seeds sown. In the present connexion, it is only necessary to say that a very tolerable sward was established, despite the fact that at no time was the strip protected from the sheep.*

The point to be emphasized is the perfectly amazing extent to which this clover and young grass—and therefore protein- and mineral-efficient—strip has been grazed. The herbage has never been permitted to grow away; sheep are always on the strip. The full extent of the grazing, although indicated by the close-cropped herbage and by the profusion of the sheep's droppings, was, however, only to be fully appreciated by reference to the herbage within the wire-mesh cages that were put down, during the grazing seasons of 1932 and 1933, to protect small areas from the sheep. In both years, as the summer advanced, the *Molinia* and fescue and other herbage, comprising the ordinary vegetation of the sheep walk, grew away rapidly into a mature

* The extent to which wild white clover, Yorkshire fog, crested dogstail, and even perennial rye-grass, have been able to establish themselves against the constant attention of the sheep has been nothing less than astounding. The whole question of establishment under these drastic conditions is now under critical investigation. Surprisingly good establishments were achieved even during the dry summer of 1933.

MANAGEMENT OF THE POORE GRASS LANDS

unpalatable and unnutritious condition, with the result that the contrast between the strip and the walk as a whole was almost incredibly great. To say that, as a whole, the strip was grazed 100 times as hard as the walk would assuredly have been no exaggeration, and indeed that little strip must have contributed a very appreciable, if not quite a considerable, share to the sum of protein and minerals taken by the 600 sheep grazing the whole 300 acres.* Of all the examples that our work has given of selective grazing, and of what one might describe as knowledgeable holding to nutritious herbage on the part of the sheep, this strip stands pre-eminent, and affords as much food for thought as it has undoubtedly provided sustenance for the sheep.

So much for the combined influence of manures and the introduction of more palatable and more nutritious species. We must now consider the influence of manures without the introduction of better species.

In his most recent paper, Milton² has given some very striking results obtained on open hill grazings. A complete dressing, including lime, nitrogen, phosphates and potash, has had a greater attraction for the animals and brought about closer grazing than has an application of any single ingredient. Such a dressing has been effective alike on *Molinia* and fescue-*Agrostis* pastures, both of which have been completely devoid of legumes. Nitrogen-phosphates-potash have been very effective, but not to quite the same extent as when lime had also been added.

There is decided evidence for thinking that, even in the absence of clover, lime alone, subsequently to the year of

* Chemical analyses of the herbage from this particular strip in comparison with that of the walk as a whole are not available. Professor Fagan has, however, analysed the herbage from an improved and well-grazed area at Pwllpeiran (the headquarters of the Cahn Hill-Improvement Scheme) in comparison with that of an under-grazed and unimproved area. The figures given below have been kindly provided by Professor Fagan and are based on samples taken at the end of October, 1933:—

Percentages based on dry matter.				Improved pasture. Per cent.	Unimproved pasture. Per cent.
Ether extract	..	..	..	3.41	2.85
Crude protein	..	..	..	18.90	7.08
True protein	..	..	..	12.42	6.21
Fibre	..	..	..	19.56	31.97
Ash	..	..	..	16.61	3.16
Soluble carbohydrates	..	..	..	47.52	54.94
Silica (SiO ₂)	..	..	..	4.89	2.18
Silica-free ash	..	..	..	5.72	0.98
Phosphoric acid (P ₂ O ₅)	..	..	..	0.85	0.16
Lime (CaO)	..	..	..	0.55	0.20
Potash (K ₂ O)	..	..	..	2.50	0.68
Chlorine (Cl)	..	..	..	0.88	0.25

MANAGEMENT OF THE POORER GRASS LANDS

application, has a definite influence on palatability, and the palatability may be more evident with cattle than with sheep. Phosphates alone, in the absence of clover, apparently, cannot be relied upon to influence palatability, although in some instances they would seem quite definitely to have the power of doing so. For example, on the land now taken over by the Cahn Hill-Improvement Scheme, a large area of *Molinia* bog was burned in April, and most of it slagged. All through the summer, it was grazed with cattle and sheep. From the very outset, there was no mistaking the fact that the cattle in particular held almost exclusively to the slagged area, which was grazed particularly hard. *Molinia* is of course strikingly deficient in minerals, and the effect here noted may have owed something to the lime contained in the slag.

The point of chief practical significance, however, is the fact, definitely proved, that a complete dressing of lime, phosphates, potash and nitrogen attracts the animals to areas so manured. This results in closer grazing, and affords the animals a ration richer in protein and minerals than that given by the unmanured natural vegetation. The immense value of this, on large areas of natural pasture that are inherently poor in minerals, and are seldom grazed sufficiently hard to give a protein-rich ration, can be easily appreciated. Where areas are so treated on open hill grazings, the animals are therefore given an alternate ration of an altogether higher nutritive value than that offered by the grazing as a whole; and, by their harder grazing, they will improve the manured area progressively as the years advance, although perhaps in most instances no very marked improvement will be effected till after the lapse of two or three years.

(3) *The Effect of Matured, Burned and Dried Herbage, and of Inflorescences.*—The influence of over-maturity, burn and excess of inflorescence stems, has been repeatedly emphasized in connexion with our work on palatability. The tendency is for whole areas that display any of the above defects to be neglected. This neglect on the part of the animals becomes rapidly cumulative and intensifies selective grazing with consequent concentration on the green, inflorescence-free and succulent patches. During the particularly dry summer of 1933, we have had several opportunities of noting the marked effect of the inflorescences of Yorkshire fog, crested dogstail

MANAGEMENT OF THE POORER GRASS LANDS

Agrostis and sheep's fescue in rendering large areas almost completely distasteful to sheep. Perhaps it is not sufficiently realized that the inflorescences of the above grasses, particularly when present in large quantities, are frequently a prime cause for the neglect of otherwise excellent areas, and probably just as detrimental as burned and dried herbage. On ordinary enclosed fields, the mowing machine can always be used to rectify matters. The fescue-*Agrostis* pastures of the open hills should be grazed much harder than is the normal practice if they are to be turned to any very effective use during the summer. The rapid deterioration of under-grazed herbage only serves to emphasize the need for maintaining considerable areas on every open hill, or on every poor field, in a closely-grazed and nutritious condition.

Discussion and Practical Suggestions.—The fact that timothy appears to add to the palatability of a mixture as a whole, tends to emphasize the importance of this species as a pasture grass. Under grazing conditions, however, this species does not long survive.

The indigenous strains of timothy (e.g., S.48 and S.50, produced at the Plant Breeding Station), have, however, shown themselves not only to be highly palatable but definitely able to persist longer than the ordinary non-indigenous strains. Such strains, therefore, should be of immense value for inclusion in grazing mixtures.

The fact that red clover and white clover tend to be neglected when they contribute in overwhelming amount to the herbage, together with the fact that they are grazed hard when alternate herbage is offering, is of great significance: of greater significance still when their high feeding value is fully appreciated.* This behaviour of the animals, relative to excess of clover, is on all fours with the behaviour of sheep relative to rape and to hardy green turnips. In connexion with our hill work, we have been fattening lambs on rape, but have generally penned them on an area consisting of a breadth of Italian rye-grass as well as of a breadth of rape. We have also been fattening wethers on hardy green turnips, and they have been penned on an area including a breadth of rough grazing as well as

* Williams³ has shown, for example, that during August and September, broad red clover has a considerably higher fattening value than Italian rye-grass. Experiments conducted by Iorwerth Jones⁴ with sheep have afforded a remarkable demonstration of the influence on the fattening ability of a sward of a satisfactory white clover contribution.

MANAGEMENT OF THE POORER GRASS LANDS

of the turnips. In neither instance have the sheep been turned from diet to diet, but they have been granted an alternate ration *in situ* and they have done exceptionally well.

It is the advantage to be gained by providing an alternate diet *in situ* that appears to be emphasized by results such as these, and that, as a factor in pasture management, would seem to merit very serious consideration. As regards pastures, the endeavour formerly was to provide an alternate diet by including a great number of species in the mixture. In practice, this does not, however, answer very well, because the grazing animal and the management in general always tend to reduce the number of effective species far below what was intended. A better plan would be to sow out a field in a limited number of highly contrasting simple mixtures—so designed as to establish a fair variety of species. All the evidence suggests that a legitimate and, indeed, a sound policy to work upon, is to assume that the grazing animal not only grazes what it likes but also what is good for it—and that it needs variety.

Red clover leys would probably be grazed better if a certain number of non-clover strips ran through the field, say strips sown with a simple mixture of grasses only. Further, fields very propense to white clover would almost certainly be grazed better, when the clover is making most luxuriant growth, if strips had been sown with indigenous cocksfoot only—a grass that definitely impedes the development of white clover. Similarly, on large and enclosed areas of rough grazings that are improvable by methods that will lead to a great growth of white clover, fairly considerable strips should be left untreated, with the object of providing the all-important alternate diet *in situ*. Then there is the matter of medicinal herbs, or herbs with particular dietetic properties—assuredly a supremely important matter, but one that modern agricultural science woefully neglects. If we knew all about these herbs, those to be desired should be established not by sowing them as ingredients in a general mixture—but in suitable simple mixtures in patches on the field.

The strip method of sowing out fields on the basis of the evidence already discussed would, however, raise certain difficulties. The different mixtures must not be allowed to differ too much in palatability, or important strips may be over-neglected, particularly at certain times of the year. The less palatable mixtures should therefore always include

MANAGEMENT OF THE POORER GRASS LANDS

timothy, while the intervention of the mowing machine can generally be made to rectify pronounced neglect on the part of the animals.

When we turn to the poorer types of permanent sward, our evidence is perfectly definite and of the greatest importance in relation to large unfenced areas, and in relation to outlying fields. In both instances, strips or blocks of improved herbage can be established with comparative ease. In some situations, it is only necessary to apply manures, while in others it is better to cultivate, manure and sow seeds. The herbage produced will be protein-efficient by reason of the closer grazing, and mineral-efficient because of the mineral manures and the white clover. The benefit to the stock, having access to such strips or blocks, must therefore be out of all proportion to their actual size. To establish the proper ratio of improved to unimproved, in order to produce the best and most economic results, will demand prolonged inquiry, but it is well worthy of full and detailed exploration. We may here mention that Mr. Bligh of Cilmerly Park, Builth Wells, has been adopting the method of ploughing up the worst and least well-grazed areas on some of his poorer fields, manuring and sowing (without in any way protecting from the stock), with results that appear fully to support the soundness of the suggestions we are putting forward.

The only object of this article is to ventilate the idea of dealing with the poorer of our grass lands on a block or strip basis within each enclosure—large or small. The matter demands not only extensive experimentation but, what is of even more importance, much thought and observation. The thinking must precede the experimenting, and we have here endeavoured to arouse the interest of the practical man—of the grazier himself. The time for making definite and explicit suggestions is not yet.

REFERENCES.

- ¹ Milton, W. E. J. The palatability of the self-establishing species contributing to different types of grassland. *Empire Jour. Exper. Agric.*, I, 347-60. 1933.
- ² ——— The relative palatability of seeds mixtures, and a study of the influence of fertilizers on natural hill pastures. *Ibid.* 5, 51-64. 1934.
- ³ Williams, R. D. Winter keep. *Welsh Jour. Agric.*, I, 119-30. 1925.
- ⁴ Jones, L. I. Iorwerth. Preliminary experiment to test the reaction of sheep (live weight increase) to different species and strains of grasses and clovers and to test the yield and other characters of the species as such. *Welsh Plant Breeding Station Bulletin, Series H.*, No. 13, 95-121. 1932.

THE CONTROL OF CLUB ROOT FINGER-AND-TOE) IN CAULIFLOWERS

N. C. PRESTON, B.Sc.,

Harper Adams Agricultural College, Newport, Salop.

THE following article summarizes the results of co-operative trials by Advisory Mycologists in England and Wales in 1932.

Previous results obtained in certain areas by using corrosive sublimate (mercuric chloride) for controlling Club Root of Brassicae had proved so promising that it was decided, at a Conference of Advisory Mycologists held in 1931, that this method of treatment should be tested on a more extended scale by co-operative experiment. In 1932, therefore, trials of this method were carried out, under a uniform scheme, at one or more centres by the following Advisers in Mycology:—D. W. Davies, in Cardiganshire; N. C. Preston, in Staffordshire; J. Rees, in Monmouthshire; E. Holmes Smith, in Lancashire; H. H. Stirrup, in Leicestershire; and T. Whitehead, in Caernarvonshire. Soils known to be heavily contaminated with the Club Root organism, *Plasmodiophora Brassicae*, were selected for the experiment at each centre.

Procedure.—Cauliflowers of different varieties suitable to the particular centres were used throughout, the seed being kindly supplied gratis by Messrs. Clucas of Ormskirk, Lancashire. The contaminated soil upon which the young plants were raised was similar in all cases to that in which they were afterwards planted out.

Seed was sown in rows, either in open seed-beds or in frames. Just previous to sowing, half of the rows were treated with 0.05 per cent. (1 in 2,000) solution of corrosive sublimate, applied at the rate of 1 pint of liquid to every 5 ft. of row where frames were used, and at double this rate in open seed-beds. This treatment was followed by a second application, at double the rate of the first, made between the rows when the plants were about 2 in. high. The remaining half of the rows in each seed-bed received applications of clean water and thus served as controls. When the young plants had attained a suitable size, those from the treated and untreated rows were dibbled into

CONTROL OF CLUB ROOT IN CAULIFLOWERS

separate but alternating rows 2 ft. apart, except at one centre where they were planted in two separate adjacent plots. At this stage a third application of corrosive sublimate solution was given to the plants raised in treated rows, $\frac{1}{2}$ pint of the solution being applied to each hole before inserting the plant. The control rows, consisting of transplants from untreated rows, received an equivalent quantity of plain water.

At some centres, a third series of plants was set out. These were taken from the treated seed rows but received water only on transplanting.

Very little infection occurred amongst frame-raised seedlings even in the untreated rows, a point that will be referred to in a subsequent paragraph. Advantage was taken of this fact in Caernarvonshire to compare the resultant growth of healthy seedlings taken from treated and untreated rows respectively, these plants constituting a fourth series in the scheme. An essentially similar comparison was also made in Glamorganshire, where some seedlings were raised without treatment in uncontaminated soil. Hence observations were made, in all, on four series of plants:—

1. Plants that received 2 applications of corrosive sublimate in the seed-bed and 1 application when planted out.
2. Plants that received 2 applications of corrosive sublimate in the seed-bed and water only when planted out.
3. Plants that received corrosive sublimate only at the time of planting out, healthy seedlings from *untreated* seed-beds being selected for this series.
4. Plants that did not receive corrosive sublimate at any stage.

Crops were harvested in the usual way. The weight and quality of the heads, the percentage of clubbed roots and the intensity of the clubbing were determined, along with other data, for treated and control plants respectively.

The number of plants thus dealt with at each centre varied according to the ground available, but was in no instance less than 260.

Results:—(a) *Effect of Corrosive Sublimate in the Seed-Beds.*—Though critical observations were not made upon the seedlings at every centre, considerable variation was noted, nevertheless, in the effect obtained with corrosive sublimate. These variations were apparent not only between experiments in different Provinces but sometimes between individual plots at neighbouring centres.

CONTROL OF CLUB ROOT IN CAULIFLOWERS

Where the seed was sown in frames, little or no clubbing occurred, even in the untreated rows, although heavily infected soil was used. "Damping off" was noted at two centres among the untreated seedlings under these conditions, but this the treated plants largely escaped. At one centre in Staffordshire, on a clay soil, the treatment retarded germination. At another centre, on light soil, in the same county, however, the reverse effect was very evident. Observations at other centres showed that retardation was by no means general, and, where it occurred, it could often be attributed to factors other than the corrosive sublimate.

On the other hand, in open seed-beds there was often considerable clubbing. This was not entirely confined to the untreated rows but occurred most markedly where the later varieties of cauliflower were sown. Late Italian Giant, for instance, clubbed heavily in some of the open seed-beds, and at one Staffordshire centre as many as 30 per cent. of the treated and 100 per cent. of the untreated plants were affected. In North Wales, where the different varieties of Cauliflower were sown on the same date in open seed-beds, the amount of infection among the untreated seedlings increased progressively from the earliest maturing to the latest variety tested, as the following percentage of infection figures show:—

<i>Varieties.</i>				<i>Untreated.</i> <i>Per cent.</i>	<i>Treated.</i> <i>Per cent.</i>
All The Year Round	..	..	..	4.2	1.0
Early Italian Giant	..	..	..	6.9	3.8
Medium "	..	..	..	8.5	4.8
Late "	..	..	..	10.3	8.9

In general, however, even in the open beds, the larger proportion of the treated seedlings remained clean and produced good plants, while those in the untreated rows were always badly attacked.

When considering the discrepancy observed between the extent of seedling infection in frames and in open seed-beds, respectively, it is necessary to remember that the soil in each was essentially similar at any one centre. In fact, the frame soil was generally obtained from the same plot as that used for the open seed-bed. There would seem to be at least two possible explanations of this discrepancy. The first is the moisture factor. Under normal conditions the soil in the covered frame would doubtless tend to remain a good deal drier than that in the open, a condition which would certainly influence infection very considerably.

CONTROL OF CLUB ROOT IN CAULIFLOWERS

The second factor that might be almost equally responsible is the length of time to which the seedlings are exposed to infection, together with the possible greater activity of the parasite as the season advances. The period during which sowing took place in these experiments lay, for frames, between February 23 and March 30, and for open-beds between March 24 and April 13. Similarly, the time of planting out lay between May 26 and June 2 for the frame-raised plants and June 22 and July 13 for those from open seed-beds. At the Staffordshire centre, already mentioned, where 30 per cent. of the treated seedlings became infected in the rows, growth of both treated and untreated plants was exceedingly slow, while at another centre, Penhow, in Monmouthshire, where extensive clubbing of the treated seedlings was reported, the period during which the plants remained in the seed-bed was longer than at any other centre, viz., March 24 to July 13. That the varietal differences recorded from North Wales, however, are not to be explained upon the ground that the later varieties were longer exposed to infection is made clear from the fact that each of the four varieties in question was here sown upon the same date, April 13, and all the seedlings were planted out either on June 29 or June 30.

(b) *Effect of Corrosive Sublimate upon the Final Crop.*—The data obtained from examination of the mature plants were remarkably consistent and may be summarized as follows:—

- | | |
|---------------------------------|---|
| 1. Marketable Heads | { Average for treated plants 74 per cent.
" " untreated " 25 " " |
| 2 Weight of Heads
(ungraded) | { Average for treated plants 1.8 lb.
" " untreated " 0.7 " |
| 3. Severely Clubbed Roots | { Treated plants 22 per cent.
Untreated " 85 " " |

The marked contrast between treated and untreated plants is well shown in Figs. 1 and 2.

The price realized by the crop was recorded at one centre only (Aberystwyth). Here, out of 215 treated plants, 123 bore marketable heads that were sold for £1 8s. 9d. The same number of untreated plants produced only six saleable heads having a total market value of 1s. 7d.

At the Lancashire centre, where the marketable heads were graded into 1st and 2nd qualities, it was found that the treated plants produced more than twice as many 1st





FIG. 2 —Alternate rows of treated and untreated Caulflowers, variety Snowball, at Bangor. Showing effect of 1 in 2,000 Corrosive Sublimat. Solution. Middle row untreated. Rows to left and right of it, treated.

Photo: T. Whitehead

CONTROL OF CLUB ROOT IN CAULIFLOWERS

quality heads as did the untreated, the actual percentages being as follows:—

Treated	..	1st quality	77 per cent.,	2nd quality	8 per cent.
Untreated	..	" "	32 " "	" "	36 " "

At the Leicestershire centre the treated plants appeared to be deficient in fibrous roots, while at several other places—Caernarvonshire, Lancashire and three Staffordshire centres—the reverse effect was noted. Further trials to determine what effect, if any, the corrosive sublimate has upon the production of fibrous roots, apart from any question of disease, are in progress.

The necessity for applying corrosive sublimate when planting out, even though the seedlings had been previously treated, was clearly shown by the experiments in Caernarvonshire, Cardiganshire and Leicestershire, where some of the seedling plants from treated rows were finally used as "controls," i.e., were planted out without further treatment. From 84 to 100 per cent. of these plants clubbed heavily and failed to mature.

In the brief summary of results here given, it will be noted that the percentage of *badly* clubbed roots only is recorded. A study of the more detailed data given in the accompanying Table shows, however, that this is evidently the prime factor governing the production of saleable heads. The effect of particularly good cultivation is believed to be responsible for the results obtained at the Staffs Centre B. While, at all centres, comparatively few of the treated plants remained completely free from disease, and, on some plots, even the majority of them showed moderate clubbing, yet the percentage and weight of marketable heads remained greatly in excess of that yielded by the untreated plants. The value of the treatment thus seems to lie in the retardation, rather than in the actual elimination of infection, and the necessity for applying corrosive sublimate for each season's crop becomes clearly apparent.

Conclusions.—A 0.05 per cent. solution of corrosive sublimate (1 oz. corrosive sublimate in 12½ gal. water) if applied to seedlings, free from Club Root when planting out, will enable these to produce a satisfactory crop (generally over 70 per cent. marketable) even on heavily-contaminated soils. The use of corrosive sublimate for controlling Club Root in cauliflowers can therefore be recommended with confidence, provided that the poisonous nature

CONTROL OF CLUB ROOT IN CAULIFLOWERS

CO-OPERATIVE CLUB ROOT TRIALS WITH CAULIFLOWERS—1932.

COUNTY	VARIETY	MARKETABLE HEADS				EXTENT OF CLUBBING OF ROOTS*							
		Percentage		Percentage Bad		Percentage Moderate		Percentage Slight		Percentage Clean			
		Treated	Un-treated	Treated	Un-treated	Treated	Un-treated	Treated	Un-treated	Treated	Un-treated	Treated	Un-treated
Lancashire	... ..	85.7	68.44	0.0	40.0	24.53	53.33	50.94	6.66	24.52	0.0		
Caernarvonshire	All the Year Round	...	...	...	...	...	...	...	...	...	...	...	...
	Snowball (a)	79.6	17.6	30.6	78.4	34.7	3.9	32.6	7.8	Included under "Slight"			
	" (b)	86.0	28.0	58.0	84.0	26.0	2.0	16.0	8.0				
	All the Year Round	79.7	10.1	39.4	98.0	40.4	0.0	19.2	0.0				
	Early Italian Giant	...	...	...	...	...	...	...	...				
	Late	78.0	12.0	53.0	89.0	29.0	0.0	13.0	0.0				
	" (a)	70.7	1.2	12.0	92.0	26.0	1.2	55.0	0.0				
Leicestershire	" (b)	80.0	0.0	25.0	100.0	40.0	0.0	35.0	0.0				
	Medium "	83.0	4.0	39.0	91.0	28.0	0.0	26.0	0.0				
	Mixed Varieties	80.0 approx.	1.0 approx.	0.0	100.0	100.0	0.0	Included under "Moderate"		0.0	0.0		
	...	...	...	...	...	...	...	...	...	...	...	...	...
Cardiganshire	All the Year Round	57.2	2.8	0.0	95.8	82.2	0.0	12.5	0.9	0.0	0.0		
Staffordshire—	Centre A	72.0	26.0	15.0	63.0	16.0	4.0	51.0	5.0	5.0	0.0		
	B	97.0	99.0	1.0	57.0	15.0	12.0	63.0	15.0	19.0	11.0		
	C ₁	77.0	14.0	34.0	88.0	11.0	2.0	43.0	1.0	6.0	1.0		
	C ₂	85.0	69.0	11.0	72.0	0.0	8.0	34.0	7.0	54.0	13.0		
Monmouthshire—	Centre 1	65.0	32.5	—	—	—	—	—	—	—	—		
	2	65.4	46.7	—	—	—	—	—	—	—	—		
	3	70.0	16.0	0.0	66.0	—	—	5.0	0.0	—	—		
	4	54.0	10.0	—	—	—	—	—	—	—	—		

*Plants which failed completely, or which had their roots so destroyed that the extent of clubbing could not be determined, have not been included in these percentages.

CONTROL OF CLUB ROOT IN CAULIFLOWERS

of the chemical is suitably stressed and the necessity for taking adequate precautions to guard against accidents is made clear to the grower who proposes to use it. This treatment is particularly suited to areas where an adequate rotation of crops is more or less impracticable, but it is to be regarded as a supplementary measure not in any way superseding the necessary use of lime.

The use of corrosive sublimate solution on contaminated seed-beds, at the time of sowing and again when the plants are about 2 in. high will temporarily control Club Root and thus enable a fair proportion of healthy seedlings to be raised.

The precise effect of corrosive sublimate in the seed-bed appears to vary under different conditions and is being further investigated.

ACKNOWLEDGMENTS. Thanks are especially due to Mr. A. A. Clucas of Messrs. J. L. Clucas, Ltd., Ormskirk, for so generously supplying the seed used in all these experiments and for the very keen and practical interest he has shown in this work.

SNAPDRAGON (ANTIRRHINUM) RUST

GEO. H. PETHYBRIDGE, B.Sc., Ph.D.,
*Ministry of Agriculture Plant Pathological Laboratory,
Harpenden.*

IN the issue of this JOURNAL for September, 1933, p. 486, a brief note was published concerning the occurrence of Snapdragon Rust (*Puccinia Antirrhini* Diet and Holw.) as a new disease in England. Following the publication of that note, a survey of the situation in regard to this Rust was made, the results of which it seems desirable to put on record.

The Rust was first recognized in Britain by Mr. D. E. Green of the Royal Horticultural Society's Gardens at Wisley, Surrey, on specimens received by him from Kent; and confirmation of its identity was obtained from the Ministry's Plant Pathological Laboratory. A short illustrated article on the subject, by Mr. Green, was published in the *Gardeners' Chronicle* for August 12, 1933, p. 131.

As a result of the publicity given to the discovery here of this hitherto supposedly alien Rust, and because its ravages have, in very many instances, been self-evident, the existence of a considerable number of cases was revealed. Most of these had been reported direct to the Plant Pathological Laboratory, and, in the majority of them the presence of *Puccinia Antirrhini* was confirmed by examination of specimens. In one or two instances, however, the disease suspected to be the new Rust proved to be one already well established here, namely, that due to the Shot Hole fungus (*Heteropatella Antirrhini* Budd. and Wakef.). Other cases of the occurrence of the Rust were recorded in the horticultural Press.

By the end of October, 1933, sixty-three outbreaks had been noted, and doubtless there were others the existence of which had not been notified. The counties in which the outbreaks had then occurred were:—Sussex, 15; Hants (including the Isle of Wight), 13; Kent, 12; Surrey, 8; Essex, 7; Norfolk and Devon, 2 each; and Suffolk, Herts, Oxon. and London, 1 each. Thus, during last season, Antirrhinum Rust had evidently been widely distributed in eastern and southern England and had reached Devonshire

SNAPDRAGON (ANTIRRHINUM) RUST

in the west. Sometimes the attacks had been slight, at others almost devastating to the plants.

It is interesting also to note that two cases were discovered in France. The first, from Giverny (Eure), was reported to the Ministry's Pathological Laboratory by an English lady travelling in that country, and was confirmed by the examination of a specimen subsequently forwarded. Since this appeared to constitute a new record for the European continent, it was thought desirable to bring the occurrence to the notice of Monsieur Etienne Foëx, Director of the Station Centrale de Pathologie Végétale, at Versailles. On receipt of the information, M. Foëx caused a search to be made at once in the *Antirrhinum* beds at his Station and, unexpectedly, three plants slightly affected with the Rust were discovered in them. Until 1933 *Puccinia Antirrhini* was known to occur only in the United States of America, in Canada and in Bermuda; last year's discoveries therefore extended the range of its distribution to England and the continent of Europe.

Although the Rust was seen and identified for the first time in England last year (1933), yet the large number of cases then met with, together with their rather wide distribution over southern and eastern England, would naturally suggest that it had probably been here in previous seasons, but had passed unnoticed, or at any rate had not been seen by or reported to plant pathologists. In this connexion, it is worth recording that in one instance a foreman gardener, when shown a specimen, without being enlightened as to what it purported to be, at once exclaimed that it was *Antirrhinum* Rust and that he had seen it two years ago in a nursery in Essex. Again, a correspondent in Kent, in forwarding specimens, stated that one of his men remembered an outbreak of this Rust that occurred in the adjoining county of Sussex eight or nine years previously. Finally, this Rust appears to have been seen (but not mentioned) by a competent observer in a nursery in the south of England in the year 1921, the summer of which, it is interesting to note, resembled that of 1933 in being very dry and hot. It would seem, therefore, that although 1933 is the first year of record for this Rust in England it is almost certainly not the first year of its occurrence.

In the absence of definite evidence on the point, the question as to how the Rust reached this country or France, cannot be answered. The gardener is at once tempted to

SNAPDRAGON (ANTIRRHINUM) RUST

suspect the seed and blame the supplier of it, remembering, possibly, that the somewhat similar Rust of Hollyhock is a seed-transmitted disease. Nevertheless, conclusive proof of the transmission of Rust diseases through the seed is not forthcoming in many instances, whilst actual trials to transmit Antirrhinum Rust by sowing seed from affected plants have failed.* Plants raised from seed, purposely gathered from badly rusted plants in the field and in the greenhouse, sown in the ordinary manner did not develop any Rust, even when the seed was taken from capsules on which Rust pustules were present. A further somewhat similar case deserves mention. In a glasshouse, where Snapdragons had been severely attacked by Rust in the previous year, Mignonette was grown. Many "volunteer" seedling Snapdragons (descendants of the rusted plants) arose, but they remained absolutely clean and free from Rust. Thus, plants from seed, derived from rusted plants, were free from Rust although they grew in the space occupied by their diseased parents in the previous year. Negative evidence is, of course, not altogether satisfactory, particularly if there is not a great deal of it. Still, until some really positive evidence of seed transmission is obtained, it would appear premature to embark on a project of wholesale seed disinfection to prevent the future occurrence of this Rust, as has been suggested by one writer.†

On the Snapdragon, the Rust produces spore-pustules of two kinds, and both have been abundant on most of the English plants examined. The earlier-formed ones, when mature, are brown and powdery. They contain large quantities of single-celled summer spores (*uredospores*) which, when dispersed, cause further infections during the summer; from these, under favourable conditions, still further crops of similar pustules result as time goes on, and thus an epidemic may arise. The summer spores germinate readily in the presence of moisture, but they are comparatively short-lived, retaining their vitality for about six weeks only. The later-formed pustules are darker, nearly black; and they are compact in consistency rather than powdery. They contain two-celled winter spores (*teleutospores*), but such spores are also produced to some extent in the later-developed summer-spore pustules. The winter spores do not germinate very readily, even after overwintering, but

* G. L. Peltier, Illinois Agric. Exp. Sta. Bull., 221, 1919.

† Gard. Chron., 94, 1933, p. 274.

SNAPDRAGON (ANTIRRHINUM) RUST

when they do, each cell of the spore normally gives rise to four delicate "sporidia" (*basidiospores*). All attempts to infect *Antirrhinum*s with these basidiospores have failed, thus indicating, by analogy with other Rusts, that *Puccinia Antirrhini* probably requires two different hosts in order to complete its life-cycle. What the alternate host to the Snap-dragon is has not yet been discovered, but it is thought likely that it may be some wild plant living in California, where Snapdragon Rust was first discovered in 1895, although it was not described until four years later.*

Apart from seed-transmission, and the possibility of overwintering by teleutospores and recurrence in the following season from Cluster-cup spores (*aecidiospores*), produced on an unknown alternate host, it would seem that this Rust can survive from one season to the next only by means of *Antirrhinum* plants that are overwintered, either in the open, in mild districts, or under glass. Where this Rust has occurred, therefore, it would be unwise to keep any Snapdragons over the winter. Next season a fresh start should be made from seed. As to the summer spores that have been dispersed, these will die before or during the winter, unless they reach overwintering plants, which may then become freshly infected. If all the affected plants have been burned, most of the crop of winter spores will have been destroyed. If any are left, the probable absence of an alternate host from this country suggests considerable security.

In the United States of America, it has been shown conclusively that overwintering of the Rust occurs by means of summer spore infections on plants in glasshouses; and it is from these plants that the Rust develops again in the following summer in the field or garden.

As to control of the Rust by spraying or dusting, it has been proved that spraying with Bordeaux Mixture is practically useless. On the other hand, treatment with sulphur fungicides has proved advantageous. Dusting with very finely-divided sulphur has been found to be the simplest and most effective treatment, but success depends largely on the prevalence of a high temperature. In a glasshouse, dusting with sulphur (starting when the first signs of Rust appear) and, at the same time, raising the temperature to about 70° F., and not allowing it to fall below about 50° F. at night, has been found effective. In the field or

* *Hedwigia*, 36, 1899, p. 298.

SNAPDRAGON (ANTIRRHINUM) RUST

garden, control of temperature is of course impossible, but a hot summer, such as that experienced in 1933, whilst probably conducive to the development of the Rust, would also intensify the fungicidal effect of sulphur dusted on the diseased plants.

* * * * *

The above account was written in November, 1933, and the following additional particulars bring the information up to date (June, 1934). To the list of English counties, in which *Antirrhinum* Rust has now been found, must be added Bucks, Berks, Wilts and Cambridgeshire. Several cases of the overwintering of the Rust in its uredospore stage, both in frames and in the open, have been reported recently. A detailed article on the Rust was published early in the present year by D. E. Green,* whilst information concerning its distribution in France, where it appears to have been seen first, in the autumn of 1931, at Grignon, has been published by G. Viennot-Bourgin.† During the past winter, seeds of ten different varieties of *Antirrhinums*, collected from Rusted plants, have been sown at the Plant Pathological Laboratory, and the seedlings grown under conditions precluding infection from extraneous sources, without any trace of the Rust appearing on them.

* *Jour. Roy. Hort. Soc.*, **59**, 1934, p. 119.

† *Rev. Path. Veg. Ent. Agric.*, **20**, 1933, p. 283.

CORRESPONDENCE COURSES AS AN [AID TO AGRICULTURAL EDUCATION

G. H. GARRAD, N.D.A. (*Agricultural Organizer*),
and J. N. SHARROCK, N.D.A., N.D.D. (*Agricultural
Assistant*), *County of Kent*.

FOR those who wish to learn, there are various ways of acquiring a knowledge of the scientific side of agriculture. In the county of Kent, a two-year or three-year course of instruction is provided, for men at the South-Eastern Agricultural College, Wye, and for women at the Swanley Horticultural College; a one-year course is available at the County Farm Institute at Borden; day classes in agriculture, for boys and girls between the ages of 14 and 18, are held one day each week throughout the winter at Ashford and Tonbridge; and many evening lectures are given, in all parts of the county. These facilities do not, however, meet the requirements of quite a number of people engaged in agriculture, or otherwise interested in the land, who want to get an understanding of the scientific principles underlying the practice of farming. Either they cannot be away from home for any length of time; or they do not live within reach of a centre where instruction is being given; or, perhaps, the time is not convenient, or a single lecture is insufficient for their requirements.

Kent has an excellent County Library, from which can be borrowed, for study in leisure hours, a number of useful books dealing with various branches of agriculture, and many avail themselves of this facility. While some may prefer to study in this way, mapping out their own plan of work, there are others who find that they can assimilate information better when a line of study is planned for them, and when an instructor is available to whom they can apply for further information on points that are not clear to them.

A correspondence course has the merit of supplying a systematic scheme of instruction without tying down students who are taking it, to particular dates and times, or entailing their leaving home. It was to meet the requirements of a farm pupil who could not leave the farm to attend a course of instruction elsewhere, that the first Agricultural Correspondence Course was held in Kent in 1927. It soon became evident that the Course met a general need, and,

CORRESPONDENCE COURSES IN AGRICULTURE

as a result, a Correspondence Course has been run every winter for the past seven years.

The Kent Correspondence Course.—There are many different agricultural interests in Kent, and the Correspondence Course has therefore been made fairly general in character, so that it may open up a line of study for as many people as possible. It is designed more particularly for persons actively engaged in agriculture, i.e., farmers, farmers' sons or daughters, farm pupils and farm workers; but others are not debarred, and among those who have taken a course have been agricultural merchants, teachers in rural schools, private householders with gardening interests, etc. There is no age limit. Youth or inexperience may make it difficult sometimes for a student to obtain full advantage from the instruction, but the course may also serve a useful purpose in keeping a youthful mind receptive to systematic training from the time of leaving school until the time of taking up a more complete course at the Farm Institute or College, and in preparing young students for these more advanced studies.

The course, which is advertised each autumn, starts about the end of October, and is divided into about 12 lessons, to each of which about 10 days are allotted. It thus provides systematic training during the long winter evenings, finishing about the end of February, or early in March, before the lighter evenings, and the usual rush of spring work on the farm, are likely to interfere seriously with the opportunities for study. An entry fee of 15s. is charged, but half of this is refunded to the student if he returns, in good condition at the end of the course, such text books as have been loaned to him.

The first course, held in the winter of 1927-28, dealt mainly with soil improvement and the principles of manuring; and the second, during the following winter, was devoted to foods, feeding and the management of farm animals. The principle was thus adopted of running a course on crops one year and a course on live stock in the next; but in order to make the appeal as wide as possible, the scope of each course has since been somewhat widened. Thus, the course on crops now includes the principles underlying the control of crop pests and diseases, and some of the more important points to be considered in the cultivation of the principal farm crops, as ascertained by experiments

CORRESPONDENCE COURSES IN AGRICULTURE

with different varieties, manures, rates of seeding, etc. Similarly the course on foods and feeding has been widened to include poultry and the control of animal parasites. Naturally, with courses of such wide scope, it is not possible to deal with each subject in great detail. In some counties, where a particular type of farming predominates, it might be possible to obtain sufficient students interested in one phase of agriculture to justify running a course on this alone; but, whatever the scope of the course, the primary object should always be to provide a basis of study from which the individual student can develop along any line that specially interests him.

Running of the Course.—The procedure in Kent is as follows:—After the entry fees have been received, text books are issued to the students. For the first course, on Soils, the principal book was Russell's *Farm Soil and Its Improvement*; and for the first course on Live Stock, the Ministry's *Rations for Live Stock* and Garrad's *Principles of Dairy Farming*. Later, when the scope of the courses was widened, Fream's *Elements of Agriculture*, and the Ministry's Bulletins dealing with manures, etc., were also loaned to students. For each lesson, the students are asked to read certain specified pages or paragraphs in the text books, also notes which are prepared and circulated to supplement the text-book information. From time to time, as the course proceeds, some of the printed leaflets, issued by the Ministry or other authorities, are sent out with the stencilled notes. With each lesson, a set of questions, based on the subject matter of the lesson, is sent out; and foolscap paper is supplied for the answers, together with a stamped, addressed envelope in which the answers, when written, are to be returned.

The students are urged to answer the questions without the aid of the notes or the text books, and to let some time elapse after they have finished their study before they answer the questions. The answers to each set of questions have to be returned by a specified date, and, apart from illness or some uncontrollable cause, students generally keep to the set time-table. Thus the answers to the questions on the first lesson are received by the time that the second lesson is despatched, and so on. The answers are marked, criticized and, where necessary, corrected and amended, the corrected papers being returned to the student with the subsequent lesson.

CORRESPONDENCE COURSES IN AGRICULTURE

Students are encouraged to ask questions if anything they read is not clear to them, or if they want further information; and most of them make full use of this opportunity of elucidating points on which they are in doubt. Often, by the form in which they put their questions, it is possible to see how they are grasping the information that has been supplied. As far as possible, soon after the course has begun, each student receives a visit from the officer in charge of the course, so that they may become personally acquainted. This is very helpful, not only to the student, but also to the member of the County Staff, who then discovers the kind of student he is dealing with, his local conditions and particular interests. Students are much more likely to ask questions freely of somebody they have talked with than of an unknown official. This personal contact, which encourages the asking of questions, often enables the student to apply some principle to his own practice, and it undoubtedly helps him to retain his interest, even in parts of the course which may not appear to apply particularly to his own type of farming. At the end of the course, book prizes, to the value of 7s. 6d., are awarded to each of the three students who have sent in the best complete sets of answers to the questions.

The actual expenses in running a course are very small. The entry fee covers the cost of postage and most, if not all, of the cost of stationery. There is some capital expenditure in the purchase of a supply of text books, but the books can, and do, last for a long time. In Kent, little difficulty has been experienced in getting them returned in good condition, and if they are not so returned, there is no refund of half the entry fee.

The standard of general education of the correspondence course students has varied enormously; consequently the notes supplied must be worded as simply as possible. A correspondence course has one great advantage, over other types of course provided for a mixed class, in that each student can take as long as he likes over his work without holding up others. It has sometimes appeared, at first, that, because of his poor general education, a backward student would never be able to derive much advantage from the course; but this type of student is often found to be extra keen and to return for a second course on the same subjects. The repetition has sometimes given surprisingly good results.

CORRESPONDENCE COURSES IN AGRICULTURE

Statistics.—The number of students who have taken the Kent Correspondence Courses has naturally varied year by year. There were 10 students for the first course in the winter of 1927-28; and last year (1933-34) there were 19 students, which was below the average. The average number of students per winter has been 21.3. Of 92 individual students who have taken one or more courses, 22 have been farmers or smallholders, 32 farmers' sons or daughters, 16 farm pupils, 14 farm workers, 2 gardeners, 2 agricultural merchants, 2 schoolmasters, 1 who was employed in a land agent's office, and 1 who was engaged outside agriculture but was interested in gardening.

Of these 92 individuals, 3 have taken 5 courses each, 2 have taken 4 courses, 7 have taken 3 courses, 28 have taken 2 courses and 52 have taken 1 course. This means that 152 sets of papers have been sent to students; and, on these, 121 complete sets of answers have been returned. Thus, 80 per cent. of the students entering have completed their course, and more would have done so but for illness or other unavoidable cause. A few have declined to commit themselves on paper, but it has been ascertained, through personal contact with them, that they have studied the notes and books, and made good use of them. It has been rare to find a student entering and then failing to take a real interest in the work.

General Conclusions.—As may be imagined, this type of course, if carried out thoroughly, entails a good deal of work. First of all, notes have to be prepared to supplement whatever text book is used, and the quantity necessary will vary with the type of course held. If the course is fairly limited in scope, text books might be found to cover most of the ground; but, with a more general course, unless several text books are used, the supplementary notes must be fairly extensive if they are to be of real value. Even if several text books are used, some explanatory and supplementary notes will be necessary. The preparation of the first set of notes entails, of course, the most labour; once a plan of campaign has been mapped out, the task of amending the notes is not so difficult. The duplicating of the notes, despatch of lessons, with the necessary paper and envelopes, makes considerable demand on the time of the office staff. The most arduous task of the officer in charge of the course is the marking sets of papers every 10 days. This takes

CORRESPONDENCE COURSES IN AGRICULTURE

considerable time, since the answers have not merely to be marked right or wrong, but must be criticized, amended, supplemented and, in some instances, fully answered with an explanation to cover some point that the student has been unable to grasp, or that has been misunderstood.

It might be questioned whether a Correspondence Course justified all this time and trouble. In the writers' view, such a course is well worth while, because it is the only means of imparting knowledge systematically to a large class of people so placed that they cannot attend other courses, but have leisure hours at home that they are anxious to put to profitable use. The value of the course does not end with the amount of information actually given in the lessons, for some of the younger students, who have shown real promise, can be recommended confidently for scholarships, or encouraged in other ways to go on to a Farm Institute or College. Such students, but for the Correspondence Course, would never have been discovered. Even students who are too old, or too occupied, to take their education a stage further in this way, have obtained a grounding that enables them to continue their studies at home along their own lines, but with a better understanding of what they are doing or reading than would otherwise have been possible. The number of students who have passed through the seven courses held in Kent, and their keenness, as shown by the high proportion of completed papers returned and the many practical questions that they have sent with their papers, proves that Correspondence Courses attract students who are well worth encouraging.

THE CONTROL OF MITES IN CHEESE STORES

H. T. CRANFIELD (*Advisory Chemist*), A. ROEBUCK (*Advisory Entomologist*), and J. G. W. STAFFORD (*Head of Dairy Department*),
Midland Agricultural College, Sutton Bonington,
Loughborough.

THE most destructive pest with which the Stilton cheese-maker has to contend is undoubtedly the cheese mite. By far the most prevalent species in the Midlands is *Tyroglyphus longior*. Observations on its life history have been given by Eales.^{1*}

Although this mite will attack any dry-coated cheese, it is chiefly in Stilton dairies that serious depredations occur. Stilton and Wensleydale cheeses appear to be more susceptible to these attacks than pressed cheeses such as Cheddars and Cheshires. Under favourable conditions, cheese mites develop with extraordinary rapidity, and some method of control is necessary to prevent very serious loss to the maker.

Various methods of control have been suggested,^{1&2} including dipping the cheese in hot water, subjecting it to steam, spraying with 5 per cent. formaldehyde solution, or fumigating the store with carbon disulphide. Of these, the only one that appears to be effective is the last-named. Carbon disulphide is a volatile, evil-smelling liquid, and, moreover, forms with air a highly explosive mixture. In the autumn of 1930, the authors fumigated a Stilton cheese store of 2,000 cubic feet capacity, 6½ lb. of carbon disulphide being used for this purpose. The room contained over 1,000 Stiltons and the results from this treatment were highly satisfactory.

In view of the highly dangerous nature of carbon disulphide, it was decided to experiment with a variety of substances, known to have, or suspected of having insecticidal and acaricidal properties, in order to ascertain whether an equally efficacious, but less dangerous, acaricide could be found. Four factors in such an acaricide would appear to be essential:—

1. That it will kill a high percentage of the mites, including those in the crevices of the cheeses

* For references, see page 352.

CONTROL OF MITES IN CHEESE STORES

2. That it shall be non-flammable, and in no way dangerous to use.
3. That it shall be reasonably cheap.
4. That it will not impart a flavour to the cheese or damage its market value in any way.

As a preliminary experiment, batches of mites, freed from particles of cheese (so that their activities could be more closely observed), were placed in glass tubes and subjected to treatment by various substances. The results were as follows:—

A	B	C	D
<i>Substances which killed all mites in half an hour</i>	<i>Substances which killed all mites in 24 hours.</i>	<i>Substances effective only after a longer period than 24 hours.</i>	<i>Substances non-effective</i>
Glacial acetic acid	Sage oil	Sulphur (powder)	Terpineol
Amyl acetate	Amyl alcohol	Magnesium oxide powder	Calcium hypochlorite
Ammonia	Formaldehyde	Nicotine	Sodium fluoride
Tetrachlorethane			Tobacco powder
Dichlorethylene			Pyrethrum powder
Tetrachlorethylene			Hellebore powder
Thymol (absorbed in gypsum)			Naphthalene
Carbon disulphide			
Sulphur dioxide			

Obviously, the substances in groups A and B were the only ones worth considering. Of these, dichlorethylene is inflammable and, therefore, like carbon disulphide, was rejected as unsuitable. Of the remainder, it was ascertained by experiment that amyl acetate, tetrachlorethane, tetrachlorethylene and thymol gave a very undesirable flavour to cheese. The remaining three, glacial acetic acid, ammonia and sulphur dioxide were finally selected for more extensive trials. Single cheeses were enclosed in vats and exposed to the fumes of these three substances respectively. The results were as follows:—

- (a) Ammonia appeared to have no adverse effect on the cheese and the kill was satisfactory.
- (b) Glacial acetic acid did not seem to kill the mites so well on the cheese as in a test tube, and the quantity of moisture present made the cheese sticky and wet.
- (c) Sulphur dioxide coloured the cheese yellow and rendered the coat sticky. The percentage of mites destroyed was high.

As a result it was finally decided to try out ammonia on a commercial scale.

Ammonia is a cheap substance available in concentrated solution or in the form of a pure liquid stored under high pressure in cylinders; moreover, it is non-poisonous, is not inflammable and does not appear to injure the marketable quality of cheese in any way. It should be noted here that

CONTROL OF MITES IN CHEESE STORES

ammonia is actually produced in small quantities during the ripening of cheese.

Large-scale Experiments.—The following trials were carried out:—

1. 1931.—A number of infected Stilton cheeses in the College Dairy were placed in a small room and exposed to ammonia fumes by allowing concentrated ammonia solution (*Liquor ammon. fortis*) to trickle slowly on to bags spread on the floor of the room, the windows and doors of the room having been sealed up by means of strips of gummed paper. The amount used was one Winchester (approx. $\frac{1}{4}$ gal.) to 1,000 cubic feet of air space, thus giving a concentration of 1:35 of ammonia gas. After 48 hours the room was opened and it was found that a kill of over 90 per cent. had been obtained amongst the mites on the shelves, and on the outside of the cheeses, but many inside the crevices of the cheeses remained alive.
2. 1931.—A cheese dairy in Leicestershire reported a case of badly infected Stiltons, and a batch of 50 was treated with ammonia in the same way as in experiment No. 1 and at the same concentration (1:35). The room was unsuitable for the purpose since it was impossible effectively to seal up all crevices. Only a moderate kill was obtained.
3. 1932.—A second Stilton cheese dairy in Leicestershire, containing 600 Stiltons, was fumigated with ammonia solution, four winchesters being used in a room of 3,500 cubic ft. capacity. This gave a concentration of ammonia rather greater than in the previous trials. After two days the room was opened and examination of the shelves and cheeses revealed a kill of 75 per cent.

In view of the results obtained in the preceding three experiments, it was decided to use, in any future trials, ammonia gas from cylinders, since in rather damp cheese stores it was impossible to obtain anything like complete evaporation of the ammonia solution. In the following experiments, cylinder gas was utilized.

4. 1933.—An instance of Stilton cheeses being badly infected was reported by a factory in the Midlands. 1,000 cheeses were being stored in a room of approximately 8,000 cubic feet capacity, and after the usual sealing up, $8\frac{1}{2}$ lb. of gas were slowly released through a rubber tube passing through a hole in the door of the room. This quantity gave a concentration of 1:45. Two days elapsed before the room was opened. Only a moderate kill resulted and therefore it was decided to subject the cheeses a week later to a second fumigation. On this occasion $13\frac{1}{2}$ lb. of ammonia were used, giving a concentration of 1:28. The kill on this occasion reached 92.5 per cent., a highly satisfactory figure. After the second fumigation an increased wetness of coat was observed on many of the cheeses. This is referred to later.
5. 1933.—Two cheese stores (cellars) at the College Dairy, containing Stilton and other cheeses, were fumigated with ammonia gas, sufficient being used to produce a concentration of 1:25. After 12 hours the rooms were opened and ventilated. Samples of dust were examined subsequently and the average kill was 95.3 per cent. Amongst the cheese fumigated were several Cheddars and Cheshires and, as is usual with these types of hard-pressed cheeses, they had been greased and bandaged. After opening

CONTROL OF MITES IN CHEESE STORES

the rooms and ventilating, a strong acrid ethereal odour was noticed and this was found to emanate from the bandages around the Cheddars and Cheshires. These bandages, moreover, were slimy, and, in spite of several weeks ventilation, the odour persisted. Removal of the bandages, however, removed the unpleasant odour and no trace was noticeable in the cheese itself. The Stiltons and Wensleydales did not appear to possess this strong odour. It was associated only with the hard-pressed cheeses.

Experiments have shown that *ammonium butyrate* possesses this pungent odour. It is assumed, therefore, that butyric acid, traces of which occurred in the cheese coat, was the causative factor.

6. 1933 —A large Stilton cheese cellar, at a factory in the neighbourhood of the College, was treated with cylinder ammonia gas at the rate of 15 lb. per 6,000 cubic feet air space. This rather higher concentration of 1:20 was decided upon as it was found to be difficult to render the store reasonably airtight owing to numerous ventilators, etc., which could not be sealed up in a very satisfactory manner. After 12 hours, the room was opened and examination of the shelves and cheeses revealed a kill of 90.9 per cent.

In this last trial, the odour of *ammonium butyrate* was observed to a slight extent after the rooms were opened and ventilated, and it was also noticed that the coats of several cheeses were very wet and slimy. The wetness was more prevalent on the smoothest coated cheeses and appeared to be due to moisture attracted to the surface of the cheese by the ammonia. Thorough ventilation reduced the wetness to some extent.

These numerous tests have indicated that ammonia gas in suitable concentration is a reliable acaricide for the destruction of cheese mites, and it may be stated here that in no case was any detrimental effect on the flavour of the cheese observed.

Method of Application Recommended.—Undoubtedly the best form in which to use ammonia for fumigating cheese stores is compressed ammonia in cylinders. In the experiments referred to, the metal tube connected to the nozzle of the cylinder was joined to a length of rubber tubing (ordinary laboratory bunsen tubing was actually used) and this was passed into the room through a small hole in a shutter or door, the tube extending well into the room, and, moreover, lying on the floor. With tubing of this size and strength one could not admit the gas very quickly, and it was found that the rate of flow could not be increased beyond 3 lb. per hour without the risk of bursting the rubber tube. By using an all-metal tube or canvas-covered rubber tubing of, say, $\frac{1}{2}$ in. internal diameter, the rate of discharge of the gas could be accelerated and the

CONTROL OF MITES IN CHEESE STORES

initial rate of concentration of the gas thereby increased. In the absence of a pressure gauge the cylinder can be laid upon the platform of a weighing machine and the weight of gas liberated thereby ascertained.

It is advisable to lay cheeses on their sides before fumigation, thus exposing the maximum of surface to the gas. The suitability of the room is an important factor. Rooms that cannot be sealed effectively are obviously unsuitable, and it is therefore suggested that a small, reasonably airtight room, capable of holding say 500 cheeses, and having an iron tube leading from the outside to the interior of the room, permanently fitted, should be constructed at all Stilton cheese stores. The fitting of an electric fan in the side of the room, for the quick removal of the gas after fumigation, would be of considerable advantage.

Cheeses should be fumigated on the first appearance of mites, i.e., before serious depredations have occurred. Later on, if mites develop again, another fumigation should be given.

Cost.—On account of the size and distribution of shelving in many of the cheese stores fumigated, and the space occupied by gangways, the amount of gas found to be necessary for an adequate concentration was much higher per hundred cheeses than would be required if a special fumigating room were available, one in which a maximum number of cheeses could be placed in a minimum air space. In two of the large-scale experiments, about 15 lb. of ammonia were utilized for a store containing 1,000 cheeses. Ammonia in cylinders costs approximately 2s. 1d. per lb. and therefore the cost per 1,000 cheeses amounted to 31s. 3d. A special fumigating room would probably reduce this cost to at least one-third of the figure stated.

Summary.—Ammonia gas at a concentration of 1:25 in a reasonably airtight storeroom has been found effectively to destroy cheese mites in less than 12 hours' exposure, and kills of over 90 per cent. have been obtained in various experimental fumigations under commercial conditions. Ammonia gas compressed in cylinders appears to be the most convenient form for this purpose. Ammonia gas does not kill the eggs of the cheese mite (no chemical suitable for use on cheeses or in a cheese store can be recommended for this purpose at present), and it is necessary, therefore, to

CONTROL OF MITES IN CHEESE STORES

subject the cheeses periodically to ammonia fumigation to prevent serious injury and an inevitable fall in their market value. For convenience in working and for maximum effectiveness, it is suggested that a suitable room be constructed to which the cheeses can be conveniently transported and subjected to ammonia gas treatment from time to time. In such a room, it would be possible to arrange the cheeses closely together, with a greater number of them per cubic foot of air space than would be feasible in an ordinary cheese store. Since the air space per cheese would be much reduced under these conditions, it would be advisable to lower the concentration of the ammonia to 1:35 or even 1:40.

Ammonia gas does not impart an undesirable flavour to cheese nor does it appear to affect their market value in any way. The wet or slimy coat that has been observed in some instances may be due to a rather too high concentration of the gas, but, in well-ventilated stores, this undue wetness should disappear in a week or so. Cheeses other than Stiltons and Wensleydales should be removed from stores before fumigation. Ammonia gas is not inflammable and is not injurious to human beings when well diluted, although care must be taken not to enter a room containing considerable quantities of the gas until it has been well ventilated.

REFERENCES.

- ¹ Eales, Nellie B.: The Life History and Economy of the Cheese Mites. *Ann. Appl. Biol.* (1917), Vol. IV, Nos. 1 and 2.
- ² Eales, Nellie B.: Cheese Mites. *This JOURNAL* (Jan and March, 1918), pp. 1087 and 1487, Vol. XXIV, Nos. 10 and 12

THE FIRST ENGLISH BOOK ON CLOVER, AND ITS AUTHOR

G. E. FUSSELL,
Ministry of Agriculture and Fisheries.

THE first English book wholly devoted to clover as a field crop was published more than 250 years ago, and the author's recommendations must have seemed as fantastic to some of the farmers of that time as do many of the theorists' panaceas for their present troubles to the farmers of to-day. Andrew Yarranton, of Ashley, in the county of Worcester, however, has been justified by the effluxion of time; and possibly some of the modern theories may be commonplaces of farming when another two and a half centuries have passed.

It is true that the little book written by Yarranton, under the title of *The Great Improvement of Land by Clover*, was not, as he was himself quite ready to acknowledge, the earliest publication to set out the advantages of clover, but it was the first that dealt solely with this crop. Although it seems to have obtained a dubious reception when published, its value has been fully recognized since. In 1854, it was said that "this little work is the most truly practical matter that had appeared in the agricultural world to the time when it was written, as it was divested of all extraneous and adventitious notices with which the writers of those times swelled their works and rendered them very perplexed and unintelligible. It contains more value in 46 pages than is in many hundreds of contemporary publications."¹* Since these words were practically repeated verbatim in 1908, we may assume that the opinion holds good.²

Only about a hundred years after his book was published, indeed, was Yarranton's service to British agriculture recognized. Clover, we are told, "was originally brought here from *Flanders*. Sir Richard Weston³ first recommended it to the *English* husbandmen, and Andrew Yarranton was one of the first who introduced it into *Herefordshire* about a century ago: He brought some of the seed of it to Ross in *Herefordshire*."⁴ Yarranton had

* For references, see page 358.

The First English Record of Clover

really done much more than this. He tells us, himself, that Sir John Winford, late High Sheriff, had sixty acres under the crop and that (as a result of his propaganda) Mr. Thomas Hill, a grazier who frequented the fairs of Worcester, Stafford and Shropshire, had cultivated the crop. It was thus in Worcester and the adjoining counties that clover was first extensively cultivated in England, although the crop was certainly cultivated in Suffolk at almost if not quite as early a date; but the four-course rotation, which embodied its use, is invariably associated with Norfolk, and has made that the most famous of the early clover-growing counties. As Ernle says: "It was long before clover emerged from the fields of gentlemen into common use; it did not penetrate into Suffolk villages until the eighteenth century. In Worcestershire and adjoining districts the personal efforts of Andrew Yarranton, in 1653-77, had for the time established its use."⁵

Yarranton's instructions for growing the crop are brief and to the point. He does what so few of his contemporaries were in the habit of doing—acknowledges his predecessors in his chosen subject. He cites Weston and Blith,⁶ and says that, after Weston's book was published, the "idea so spread itself that there was some of it (more or less) sowed in most counties of England." It had not, however, proved popular; and, in explaining the failure of those who cultivated the crop, he gives seven reasons. Amongst these may be mentioned—"the just cause of ignorance in the management, the unprepared state of the ground, and too little seed being sown." The writers of these words agree in stating that "these opinions have not yet been superseded."⁷

As to soils suitable for clover, Yarranton says that all gravelly, dry land is suitable, especially if it is limed. Land that has been tilled for six or eight years and exhausted will find clover a refreshing crop. Broomy and ferny dry land, limed after tillage, and mixed land that is limed and lies dry in the winter, as well as sandy rye land limed, are all quite the right kinds. As to clay, he says that a slightly heavier soil "not subject to clinging" and clay "not subject to retain the wet" will do.

From his experience, and he claims to have tried sowing clover in every month, he recommends sowing from March 10 to the end of April, or sowing in August after the barley is off. In the latter event, the crop may be grazed

70d
The Improvement improved,
BY
A SECOND EDITION
OF
The great Improvement of Lands
BY
CLOVER
OR,
The Wonderful Advantage by,
and right management of
CLOVER.

BY
ANDREW TARRANTON
of *Ashley*, in the County of *Worcester*.

L O N D O N
Printed by J. C. for Francis Rea, Bookseller
in *Worcester*. 1 6 6 3.

Title page of Tarranton's book on Clover

The First English Book on Clover

a little in the middle of the following April or mowed a little later. At least 12-16 lb. an acre should be sown, and never less than 12-13 lb., or the natural grass—he does not mention weeds—will kill out the plant. The seed, moreover, must be put in on a fine tilth.

A better method was to sow the clover under barley. After the barley had been harrowed, the clover seed was to be sown and lightly harrowed in with a bush harrow—an implement that has almost disappeared from the farm economy to-day. The first crop might be grazed after the barley was off, but care should be exercised. Cattle should only be allowed to graze a little while daily at first for fear of "blowing" them. This pasture afforded milk, butter and cheese superior to any other then known, Yarranton declares. The second season's crop might be mown, first in June and the aftermath in August, and a heavy yield might be expected from each cutting. All classes of stock, he says, thrive on this pasture. It is good for horses. Sheep put on clover in March will be fat in ten weeks. Swine like it at any time of the year, and it makes good hay for cattle in winter.

Yarranton finishes on a note of confidence, not quite justified at the time, but sufficiently supported in the long run. He reckons that his book will circulate mainly in Worcester, Salop, Stafford and Hereford, and he does not, therefore, describe his experiments in too great detail, believing, of course, that they would be familiar to his readers. He declared that clover could be used in open fields, and he gave a list of places where seed could be obtained.

This confidence in his recommendations is characteristic, not only of the man, but of the type of which he is an outstanding example. It is a pity that such men are usually unable to see the fruition of their schemes, which have to spread through the general intelligence slowly before they are adopted.

It is a little odd that Yarranton's book on clover has not been more freely mentioned by writers on farming literature. It is not mentioned in the eighteenth-century *Museum Rusticum et Commerciale*, a periodical that published in its fourth volume remarks on earlier farming authors; nor did Arthur Young mention Yarranton in the *Annals of Agriculture*, which ran for thirty years. The *Journal of the Royal Agricultural Society* has published many essays

THE FIRST ENGLISH BOOK ON CLOVER

on the eminent progenitors of modern farming, but Yarranton has found no niche in its pages, and C. W. Johnson, who wrote on "Agricultural Writers of the Middle and End of the 17th Century" in the *Journal of Agriculture*, XII (1841-2), does not mention him.

The cultivation of clover was not, indeed, the only scheme that Yarranton had for his country's welfare. He has been called the founder of English political economy,⁸ because he promulgated various ambitious schemes in his other work, *England's Improvement by Sea and Land*, 1677. Here again, he did not live to see the fulfilment of his designs, although many of them were ultimately brought to fruition. He certainly deserved the encomiums lavished upon him by Dove,⁸ who says he "is indeed a true practical Englishman—shrewd, but not subtle—enterprising, but not speculative—a man of business enjoying the confidence of business men, yet in all his enterprises, and in all his experiences, carefully reflecting how each particular circumstance may be turned to the advantage of his country. He is a patriot, but not a partisan Above all we must note his prospective sagacity, for he points out in detail the very course that England has pursued, and the very elements that were to contribute to her commercial supremacy."

Although Yarranton was a picturesque character, we know little of his life beyond what he tells us in *England's Improvement*. He was an apprentice to a linen-draper when Charles II was born, and continued some years in the trade; but the shop being too narrow and short for his large mind, he took leave of his master, and said nothing. He lived a country life for some years, was a soldier in the (then) late wars, and had the honour and misfortune to lodge and dislodge an army. In the year 1652, he entered upon some ironworks and plied for several years. He surveyed and made navigable the three great rivers of England; studied the great weakness of lands that are constantly cropped He entreats every opposition to his projects to be sent him, when he will take care a civil answer shall be returned . . .⁹ To these meagre details, the Dictionary of National Biography adds that he was, in 1648, instrumental in discovering a Royalist plot to seize Doyley House, Herefordshire, and that he became a captain, although nothing is known of his military career. At the Restoration, he was imprisoned in his own county, on the

THE FIRST ENGLISH BOOK ON CLOVER

evidence of documents that may have been forged, for being implicated in a projected Presbyterian rising. He escaped, however, went to London and was allowed his liberty.¹⁰

Perhaps the most ambitious of his projects was the proposal to "make Banbury a great distributing centre by connecting it with the Severn and the Thames." He "planned to make the Cherwell navigable from Oxford to Banbury, and to cut a new channel from the latter place to Shipston on the Stour, whence goods might be carried by the Avon into the Severn below Tewkesbury." The inland centres were then greatly isolated because of the indifferent roads, and Yarranton insists upon the necessity for supplying food to manufacturing centres, the prohibitive cost of conveying heavy goods by land, and the impassable nature of the roads for wheeled traffic.¹¹

Most of Yarranton's projects, according to the Dictionary of National Biography, seem to have been frustrated by lack of money. A hundred years after his day it is recorded that "it is not long since some of the boats made use of in Yarranton's navigation (of the River Stour) were found. Neither tradition nor our projector's account of the matter perfectly satisfy us why this navigation was neglected."¹²

Other plans he made were not carried out for a hundred years. "In 1674," we are told, "some friend . . . prevailed upon Mr. *Andrew Yarranton*, a gentleman extremely conversant in the commercial advantages of this island, to make a survey of the River Dee and its estuary. He drew a plan, formed the project of a new channel, a scheme for recovering from the sea a large tract of land, and restoring the ancient navigation even to the present quays: and this he got to be presented to the Duke of *York*, the patron at that time of all useful undertakings. He also suggested the idea of a canal from the collieries at Aston near *Hawarden*; which was to drop into this new channel, and facilitate the carriage of coal up to the city." Both plans were ultimately brought into execution without any great deviation from Mr. Yarranton's project,¹³ but not in his day.

A more successful enterprise was one whereby Yarranton was sent to Saxony to learn the secrets of the tin plate trade in order that the merchants who were backing him might develop the industry in this country. It is possibly hardly creditable to Yarranton, but it may, perhaps, be regarded as

THE FIRST ENGLISH BOOK ON CLOVER

honest commercial enterprise. He was welcomed by the Saxons, learned all about their processes when visiting their factories and brought the information here.

Some of his projects have remained in the realm of theory to this day. Amongst other things, he wished to constitute land banks and to arrange credit facilities for farmers, and he wanted the nation to set up granaries of corn for its own provision against years of short harvest and dear prices; but it is perhaps no place here to go too far into such questions. There is, of course, a great deal of fantastic imagination in some of the theories he advances, but there is, to most of his ideas, a sound basis of common sense. It were a pity if such as he were to sink entirely into oblivion.

REFERENCES.

- ¹ John Donaldson: *Agricultural Biography*, 1854. XLI.
- ² Donald McDonald: *Agricultural Writers, 1200-1800*. 1908, pp. 114-115.
- ³ See *A Discours of Husbandrie used in Brabant and Flanders*, 1645(?).
- ⁴ Francis Forbes: *Modern Improvements in Agriculture*, 1784.
- ⁵ Lord Ernle: *English Farming Past and Present*. 4th Ed., p. 134.
- ⁶ Walter Blith: *The English Improver*. 1649.
- ⁷ McDonald and Donaldson.
- ⁸ P. E. Dove: *Account of Andrew Yarranton*. 1854.
- ⁹ Donaldson: *op. cit.*
- ¹⁰ cf. Samuel Smiles: *Industrial Biography*. 1863. J. Chambers: *Biographical Illustrations of Worcestershire*. 1820
- ¹¹ Ernle: *op. cit.* p. 277.
- ¹² Gough (ed.): *Camden's Britannia*. ii. (1789.) p. 357.
- ¹³ Thomas Pennant: *A Tour in Wales*. 1773. 1778. p. 194.

MARKETING NOTES

Milk Marketing Scheme : Pool Prices for May.—The wholesale contract price for liquid milk in May was 1s. 0½d. per gal. in all regions. Actually only 11½d. per gal. was placed in the pools owing to the Milk Marketing Board's undertaking to expend not less than ½d. per gal. for publicity purposes in respect of *all* milk delivered under contract in May. The manufacturing price for milk manufactured into butter, cheese and condensed milk for export was 3½d. per gal.

Regional pool prices and producer-retailers' contributions compared as under with those for April, when the contract price was 1s. 1d. per gal. in the South Eastern Region and 1s. per gal. in all other Regions:—

Region.	Pool Price.		Producer-Retailers' Contributions.	
	April.	May.	April.	May.
	(Pence per gal.)		(Pence per gal.)	
Northern ..	10½	10½	1 16	1 8 2
North-western ..	10½	10	1 8	1 8 7
Eastern ..	10½	10½	1 1 11	1 8 4
East Midland ..	10½	10	1 1 11	1 8 2
West Midland ..	10½	9½	1 1 11	2 3 3
North Wales ..	10½	9½	1 8	2 3 2
South Wales ..	10½	10	1 1 11	1 8 2
Southern ..	10½	10½	1 1 11	1 8 2
Mid-Western ..	10½	9½	1 8	2 3 2
Far Western ..	10½	9½	1 1 11	2 3 2
South-eastern ..	11½	10½	1 8	1 8 2
Unweighted Average	10.64	10.02	1.34	1.83

Producer-retailers who did not sell milk by wholesale, other than on contracts carrying level-delivery premiums, were credited with a level-delivery premium of ½d. per gal. off the above contributions.

The inter-regional compensation levy was fixed at 1d. per gal. on all liquid milk sales and the whole of the proceeds, together with the sum of £60,690 drawn from the reserves in the Inter-Regional Compensation Fund, were apportioned to the Regional Pools.

No expenses levy was charged in May.

MARKETING NOTES

Sales of contract milk in May were estimated to be:—

	<i>Gallons.</i>		<i>Per cent.</i>
Liquid milk	45,116,204	..	61
Manufacturing milk ..	29,131,260	..	39
	74,247,464		100

In addition, milk manufactured into cheese on farms was estimated to amount to 3,453,613 gallons.

Annual General Meeting.—The first Annual General Meeting of Registered Producers was held in London on June 8, and was attended by nearly 400 registered milk producers. The meeting was presided over by Mr. Thomas Baxter, the Chairman of the Board, who referred to the gathering as one of historic importance. Business transacted included the adoption of the Report and Accounts, the election of three Special Members to the new Board and the fixing of the remuneration of the members of the first Board. The Special Members elected were Mr. T. Baxter, Mr. T. C. Goodwin and Mr. J. Trehane. The following amounts to be paid as remuneration to members of the Board were approved:—Chairman, £1,200; Vice-Chairman, £700; other members, £350.

The New Board.—As a result of the elections for Special and Regional Members, the new Board, which came into office on July 1, is constituted as follows:—

Regional Members.

Northern Region	Mr. O. M. McBryde.
North-western Region	Mr. C. T. Sproston.
	*Mr. F. Jackson
Eastern Region ..	Mr. J. W. Rickeard.
East Midland Region	Mr. P. R. M. Jaggard
West Midland Region	*Mr. G. G. Harris.
North Wales Region	*Mr. F. Whittingham
South Wales Region	Mr. B. Hinds.
Southern Region ..	*Lt.-Col. J. F. Duncan
Far-western Region	*Mr. W. Maddicott
Mid-western Region	Mr. J. Joyce.
South-eastern Region	*Mr. J. Garton.

Special Members.

Mr. T. Baxter.
*Mr. T. C. Goodwin.
Mr. J. Trehane.

* Denotes new member.

The scheme provides that the Board shall include, in addition, two persons to be co-opted by the elected members of the Board after consultation with the Market Supply Committee.

MARKETING NOTES

Milk Bill, 1934.—On May 31, the Minister of Agriculture and Fisheries moved a Financial Resolution in the House of Commons, giving authority for carrying into effect the proposals outlined in the Statement of Milk Policy made on February 22. The statement was reproduced in the issue of this JOURNAL for March, 1934, p. 1109. The Resolution also covered certain consequential proposals with respect to Northern Ireland which have since been formulated.

Following upon the approval of the Resolution by the House, the Milk Bill, 1934, was introduced and read a first time on June 1. The Second Reading was taken on June 7 and Committee Stage on June 13 and 19. The objects of the Bill, as expressed in the title, are "to provide for temporarily securing to producers of milk, by means of payments out of moneys provided by Parliament, a minimum return in respect of milk used in the manufacture of milk products; for conditionally requiring repayment to the Exchequer of the amount of such payments; for making, out of moneys so provided, payments for the purposes of improving the quality of the milk supply and increasing the demand for milk; for regulating the manner in which milk is described for the purpose of advertisement and sale; for imposing and conferring certain duties and powers on boards administering milk marketing schemes; and for purposes connected with the matters aforesaid."

Pigs and Bacon Marketing Schemes : Supply of Bacon Pigs.—The problem of securing greater regularity in the supply of bacon pigs throughout the year is receiving the close attention of the Pigs and Bacon Marketing Boards. The Pigs Board, in a communication recently issued to the press, sounded a note of warning to registered pig producers as to the undesirable results which must follow from the present practice of contracting to supply a much greater number of pigs in the last quarter of the year than in the early months. They stated that they were then considering contract conditions for 1935, and were contemplating measures to encourage an increased supply of bacon pigs in the months January, February, March and April, so as to produce a more even supply throughout the whole year.

Irregular supplies endangered the efforts made to build up a consumer-demand for English bacon, and would gravely prejudice the scheme for regulating home and foreign supplies. Registered pig producers are therefore

MARKETING NOTES

urged to do their utmost to supplement the efforts of the Boards, by making plans now for more regular deliveries in the next contract period.

Amendment of the Bacon Marketing Scheme.—As part of the arrangements for putting into effect the decision to reimburse curers for their ascertained losses, during the initial contract period, through the operation of the two schemes, the Bacon Marketing Board put forward certain amendments to the Bacon Scheme. The amendments have passed through without opposition, and have now been brought into force by an Order* made by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, acting jointly.

A public inquiry will shortly be held into objections lodged against two other amendments to the Bacon Marketing Scheme which were submitted by the Bacon Board.

The Ministers have also made an Order,† after consultation with the Bacon Marketing Board, amending the Scheme so as to provide for the co-option by the elected members of the Board, after consultation with the Market Supply Committee, of two additional members of the Board. The Order has the effect of bringing the constitution of the Board into line with that of other marketing boards set up subsequent to the passing of the Agricultural Marketing Act, 1933. Section 14 of that Act provides that the persons co-opted shall be selected for their commercial or financial ability, and that during a period of twelve months following the date on which the first elected Board supersedes the provisional Board nominated in a scheme, the co-option of any person shall be subject to the approval of "the Minister." As regards the Bacon Marketing Board this period expires on March 31, 1935.

Amendment of the Pigs Marketing Scheme.—A further Order‡ made by the Minister and the Secretary of State for Scotland amends the Pigs Marketing Scheme so that the Pigs Board is enabled to guarantee the loan which the Bacon Marketing Board propose to raise in connexion with the indemnity fund for curers.

Regulation of Imports of Potatoes.—In the May, 1934, issue of this JOURNAL (p. 185), reference was made to

* The Bacon Marketing Scheme (Amendment) Order, 1934.

† The Bacon Marketing Scheme (Co-opted Members) Order, 1934.

‡ The Agricultural Marketing (Guaranteed No. 1) Order, 1934.

MARKETING NOTES

action that had been taken with the object of limiting imports of *early potatoes* from foreign countries during the 1934 season. On June 6 the following announcement was made through the press:—

" Mr. Walter Elliot, Minister of Agriculture and Fisheries, who was accompanied by Lord De La Warr, the Parliamentary Secretary, yesterday received a deputation from the Potato Marketing Board consisting of Captain J. Mollett (chairman), Mr. W. Gavin, Mr. J. Stuart, M.P., Mr. H. Thompson, and Mr. E. C. Boughton (secretary). Representatives of the Secretary of State for Scotland and the Board of Trade were also present.

Capt. Mollett expressed appreciation of the help that the industry had received, and said the Board particularly desired to discuss with the Minister the supply position in the light of possible imports in the immediate future. Captain Mollett also reported that the Board had been engaged in friendly discussion with the Jersey authorities, and it was expected that this would lead to the earlier lifting and marketing of the Jersey crop.

The Minister, in reply, explained the arrangements that had been proposed, the effect of which would be to keep total imports from foreign countries down to 95,000 tons, which was less than half the average importations in the previous six years. These arrangements had been accepted by Spain (including the Canaries), which in 1933 supplied 84 per cent. of imports of early potatoes, and he was interested to learn from the Board that arrivals from Spain were expected to cease by the middle of June.

The Netherlands in 1933 sent 12,300 tons, or 13 per cent., of total imports. He understood that the acreage under early potatoes in Holland was one-third less than in 1933, and although, in view of the negotiations now pending, no definite undertaking could be given, he felt there was every reason to expect that she would adhere to the proposals in practice. For the eight months September, 1933, to April, 1934, the Netherlands had been given allocations totalling 16,000 tons of maincrop potatoes, but actual imports from that source had been no more than 10,000 tons.

As to Belgium, supplies from which in 1933 amounted to 1,350 tons, representing $1\frac{1}{2}$ per cent. of total imports of early potatoes, he understood that the acreage was lower than last year. The Belgian Government had been asked to give an assurance that they would use their best endeavours to prevent exports to this country exceeding this tonnage, and the desired assurance would, he had no doubt, be forthcoming.*

As regards Italy, whose supplies to the United Kingdom market in previous years had been very small, the peak of the export season was already passing, and as no Italian potatoes had yet been received this season, there appeared to be no reason to anticipate more than negligible supplies.

There was therefore no reason to anticipate that the market would be disturbed by imports of early potatoes this season. In the season 1933-34 producers in England, Scotland, and Wales had produced some 97 per cent. of total supplies of potatoes, and this proportion was, broadly speaking, being safeguarded for them by the arrangement he had outlined.

Regarding future arrangements, from September onwards, the Minister said he had referred the matter to the Market Supply Committee, and that as soon as their advice was received he would consider the whole matter in conjunction with the Potato Marketing Board."

* The Belgian Government have since given their assurance.

MARKETING NOTES

^{*}
In the February issue of this JOURNAL (p. 1060), were given particulars of imports of *maincrop potatoes* under the voluntary regulation arrangements for the four months September-December, 1933. These arrangements were subsequently continued for the first four months of 1934. Imports of maincrop potatoes during the period of eight months were:—

<i>Source.</i>	<i>Imports: Sept. 1933- April, 1934. (tons)</i>	<i>Authorized Maximum Figure of Imports, Sept. 1933- April, 1934. (tons)</i>
Netherlands . . .	9,924 ..	16,000
Belgium . . .	53 ..	270
Irish Free State .	5,566 ..	8,300 (a)
Other Countries .	60 (b) ..	—
Total ..	15,603	24,570

(a) Exclusive of seed potatoes and small consignments, not exceeding one ton, moved across the Northern Ireland land boundary in farmers' own carts during the four months September-December, 1933, only.

(b) Estimated, no distinction between maincrop and early potatoes being made in the official trade statistics.

Arrangements have been made for the continuance of regulation of imports of maincrop potatoes during the months of May and June, when the maincrop season draws to a close.

National Mark Cheshire Cheese.—The National Mark Cheese Trade Committee has, for the purpose of distinguishing between farm-made and factory-made cheese, approved the following definition of farm-made cheese:—

“ Cheese shall be regarded as ‘ farm ’ cheese if it is made wholly from milk produced on the producer’s own farm or farms.”

The Cheshire Cheese Federation has found it necessary to arrange assistance for their official grader to enable him to cope with the large number of applications for membership of the Federation received this season. The Federation has also derived assistance from the advisory work carried out by the staffs of the County Education authorities in its area of operations.

Cheddar Cheese.—At a meeting of Cheddar farm cheesemakers in Somerset, Dorset and Wiltshire on May 16, convened by the Somerset County Branch of the National Farmers’ Union, the Cheddar and West of England Farm-

MARKETING NOTES

house Cheesemakers' Association was formed to represent the interests of producers of farm Cheddar Cheese. A committee has been appointed, which, at a meeting held on May 30, passed a resolution in favour of approaching the Ministry in connexion with the formulation of a National Mark scheme for Cheddar Cheese.

Marketing Demonstrations at Agricultural Shows.—The Ministry's Marketing Demonstrations at Agricultural Shows will be continued during July, when the following Shows will be visited:—Royal (Ipswich), July 3-7; Great Yorkshire (Bradford), July 10-12; Kent (Ashford), July 12-14; Northumberland (Morpeth), July 18; Warwick (Coventry), July 18-19; Royal Welsh (Llandudno), July 25-27. The Ministry's exhibit deals mainly with the National Mark Schemes, with special emphasis on the newer schemes for vegetables. Egg Grading Demonstrations will be given at the Royal, Northumberland and Royal Welsh Shows; tomato grading at the Great Yorkshire and Warwick Shows; and apple grading at the Kent Show. The Milk, Pigs, Bacon and Potato Marketing Boards will stage exhibits in the Ministry's Pavilion at the Royal, Great Yorkshire and Royal Welsh; the Milk Board will also be represented at the Northumberland and Warwick Shows and the Pigs and Bacon Boards at the Kent Show. The B.B.C. exhibit will be included at the Royal, Great Yorkshire and Royal Welsh Shows. The Pigs and Bacon Marketing Boards have had made a film that will be shown along with other marketing films in the Cinema attached to the Ministry's Pavilion at the above Shows. All visitors to these Shows who are interested in the Pigs and Bacon industry should make a point of seeing this film.

Publicity for National Mark Products.—National Mark Shopping "Weeks" are being arranged in Bradford and Bolton, in connexion with the Ministry's displays of National Mark products at the Great Yorkshire Show and the Royal Lancashire Agricultural Show, which are being held respectively in these cities from July 10-12, and from August 2-6. At both places the local arrangements will be in the hands of a special committee representative of the civic and commercial life of the city. The propaganda will include shop window display competitions, open to retailers stocking National Mark products, film displays for house-

MARKETING NOTES

waves and senior school children, and essay-writing competitions for the children. National Mark products will be advertised in the local press before and during the "weeks."

Young Grocers' Tour.—During the past five years, 81 young grocers have, by their successes in the final examinations of the Institute of Certificated Grocers, earned the opportunity of increasing their practical knowledge of home agricultural produce by visiting various centres of production in this country. During July, with the co-operation of the Institute, a party of the successful candidates in this year's examination, and three teachers, are being taken for a conducted tour of selected agricultural centres, including various National Mark factories and packing stations.

Publicity for Home-grown Flowers and Plants.—One of the duties of the Flowers and Plants Publicity Committee, appointed by the Minister of Agriculture in February last under the Chairmanship of Sir Lionel Earle, G.C.V.O., K.C.B., is to advise the Ministry on the measures to be taken to secure wider publicity for home-grown bulbs, roses, trees and shrubs. On the recommendations of this Committee the Ministry has approached the local authorities of some of the more important cities and seaside resorts in order to bring to their notice the extent to which the home grower can meet their requirements, and to secure publicity for the displays of British bulbs, roses, and other plants that the authorities may have arranged in the parks and gardens under their control.

An officer of the Ministry has visited a number of these cities and seaside towns for the purpose of inspecting the displays and of advising the parks superintendent or other official concerned on various points, including, for example, the varieties of bulbs that are grown on a commercial scale in Lincolnshire, Cornwall and the Scilly Isles, which are the main centres of bulb production in this country. A list of these commercial varieties has been specially prepared for the information of local authorities, and copies will be supplied free by the Ministry to local authorities or to anyone who may be interested.

Standardized metal labels of attractive design and lettering have been prepared for the purpose of labelling displays of British horticultural products in the parks and

MARKETING NOTES

gardens of provincial cities. These labels measure $4\frac{3}{4}$ in. by $1\frac{7}{8}$ in. and are mounted on a stout metal stake $10\frac{1}{2}$ in. long. Four types of label have been prepared, namely British Bulbs, British Roses, British Trees and British Shrubs. A sample label will be supplied by the Ministry to any local authority that desires to use these standardized labels for their displays.

Reference has previously been made in this JOURNAL to the lists of British flowering shrubs and trees and British roses, which are being prepared as a guide to the special gardens laid down in the Inner Circle, Regent's Park, London. The list of shrubs and trees is new, but the Rose List is a revised edition of an earlier publication issued by the Empire Marketing Board. While primarily intended as a guide to the Regent's Park Gardens, these lists should also prove useful to the private gardener.

An up-to-date list of growers and distributors of British bulbs is also in course of preparation and will shortly be available. Copies of any of these lists will be supplied free on application to the Ministry.

Germany : Regulation of Early Potato Marketing.—An Order regulating the marketing of early potatoes was issued on April 10, 1934, with the avowed object of assuring to the German grower of new potatoes a price in keeping with market conditions, and of avoiding a repetition of the "catastrophic situation" of last year. The regulation will apply to early potatoes lifted and marketed before July 20 of each year; the date of its commencement may be varied according to local conditions.

The Order appoints a Reich commissioner for early potato marketing, who is authorized to determine which producing areas shall be regarded as "closed" (i.e., as specializing in early potatoes) and which as "open"; to fix prices and price margins; to determine the method of grading, packing, inspection, etc., and to appoint inspectors; to investigate the production and marketing of early potatoes; and to require local meetings to be held for the information of small producers with regard to the marketing control.

Two systems of regulation are provided for, to be used respectively in "closed" areas and in the remaining, or "open," areas.

In the "closed" areas the system of control is more elaborate than elsewhere. Area, district, and local commissioners will be responsible to the Reich commissioner for its administration. Producers are required to deliver all potatoes intended for sale to local collecting depôts, which consist of the establishments of existing co-operatives and local potato dealers. The district Sales Office, which is served by the local depôts, controls all sales to wholesale dealers, large-scale purchasers and retailers. Sales are made on the individual producers' accounts. Wholesale early potato dealers must be authorized as such by the appropriate department of the Reich Food

MARKETING NOTES

Office (i.e., the Ministry responsible for agriculture). The district commissioner has power to regulate supplies and may restrict deliveries. In this way producers will be discouraged from digging when the market is glutted.

In "open" districts the control is in the hands of the state (i.e., provincial) Peasants' Leader, or his deputy. Sales may only be made at a price fixed by the state peasants' organization, whose approval is required for all contracts for sale by truckload. The despatch of early potatoes for sale on commission by truckload is forbidden.

If potatoes are packed in sacks, these must be of standard size and marked uniformly with the name of the producing area, if a "closed" one. The local collecting depot is responsible for inspection. Other types of containers may be permitted.

A levy per zentner will be made to cover administrative costs.

Infringements of the regulations are punishable by fine, but appeals to arbitration are permitted.

Germany: Association of Rye and Wheat Mills.—

An Association of Rye and Wheat Mills, designed for the regulation of the production and sale of rye and wheat products (flour, meal and pollards), has now been established in Germany, with headquarters in Berlin. The constitution of the Association, which has been approved by the German Minister for Economic Affairs, provides for the laying down of basic quotas for all flour mills and the regulation of production according to current market requirements. All firms that were engaged in the milling of wheat or rye on September 2, 1933, are members of the Association, the basic quota of each being calculated by reference to the total quantity of wheat and rye milled for human consumption and for technical purposes during the years 1927 to 1932. A special permit is required for the extension of output of members' mills, for the re-opening of mills closed down, or for the opening of new mills subsequent to September 1, 1933. Such permits are to be granted only in exceptional circumstances.

The powers of the Association are vested in an Administrative Council, which sets up and controls both the "Admissions Office" and the "Quota Office," and a Director acting as the executive authority.

Every member receives a "milling quota" for the trading year, which runs from September 1 to August 31 in the year following. Separate quotas are given for rye and for wheat. Members whose daily output does not exceed 2 tons receive their full basic quota as their milling quota. The milling quotas for the remaining members are calculated and fixed according to the relation that the sum of their basic quotas bears to the quantity, remaining for allocation amongst those members, necessary to complete the prospective annual requirements of Germany as a whole. Members must declare, on account of each trading year, what proportion of their milling quota they will be able to execute, and on the basis of these figures, considered in conjunction with total warehouse stocks, directions will be issued quarterly, or more frequently if necessary, until the end of the trading year, as to what percentage of their milling quota members

MARKETING NOTES

may mill. Members must not carry, without special approval, more than one month's stock of milling products. Members who over-mill their assigned milling quota must pay a tax. The aggregate net excess quantity milled will be carried over to the new trading year, but any net quantity under-milled will not be taken into account.

The powers of the Administrative Council of the Association include the regulation of sales, the prescription of methods of marking, the standardization of types of meals and the control of milling for the purpose of fodder. The Association has power to make levies on members, assessed in relation to their milling quotas. A member who contravenes the orders published by the Association is liable to a heavy penalty. Orders and announcements of the Association are valid if they are published in the "Deutscher Reichsanzeiger"; but it is evidently intended that they shall be published also in the daily and trade press.

Proclamations recently published in the official journal lay down the monthly quantities of rye and wheat that may be milled, the grades of flour that may be made (based upon ash content) and the proportion of foreign wheat permitted. Sacks of flour sold after May 1, 1934, must be sealed and must bear details of grade and manufacture. Contract notes of uniform type are to be used by all flour mills, and, with certain exceptions in the case of small firms, flour mills must adhere to market quotations, which are fixed periodically. The terms of retail sale are also controlled.

COUNCIL OF AGRICULTURE FOR ENGLAND

THE Forty-second Meeting of the Council of Agriculture for England was held at the Middlesex Guildhall, Westminster, on June 14, MR. CLEMENT SMITH (East Suffolk) being in the Chair. Mr. Clement Smith was elected as Chairman for the year 1934-35 in succession to Mr. George Dallas, who was thanked by the Council for the able way in which he had presided over the Council during his year of office. THE RT. HON. WALTER E. ELLIOT, M.C., M.P., Minister of Agriculture, accompanied by the EARL DE LA WARR, Parliamentary Secretary, LT.-COL. A. J. MUIRHEAD, M.C., M.P., Parliamentary Private Secretary, and other officials of the Ministry were present.

Minister's Address:—MR. ELLIOT said that he greatly appreciated the courtesy of the Council in postponing the meeting until it was possible for him to be present. He appreciated it all the more since it was desirable that, especially at such a time as this, there should be personal interchanges between the Council and himself. Investigations of the utmost importance were proceeding to-day, and decisions which would vitally affect the future of agriculture had to be taken, often at short notice, and on many various aspects of agricultural production. It was impossible in such circumstances for any Minister fully to act as Ambassador of the industry, as he should do, unless he received constant stimulus from those who, like the members of the Council, were concerned in every branch of the industry in no mere theoretical way.

Coming at once to the question of beef, the Minister said that the opportunity had not yet come for him to make that statement for which the Council and all agriculturists were waiting. The beef situation remained under the closest consideration of all the Ministers responsible, not merely the Ministers responsible for agriculture, but of the Ministers responsible for commerce and Imperial affairs, who were also deeply concerned. He could assure the Council that he was taking his full part in the deliberations that were now proceeding.

They would say: "That means then that you have nothing to report." He had nothing to report, save that

COUNCIL OF AGRICULTURE FOR ENGLAND

the wheat situation, where this year the deficiency payments would be reaching £7,000,000, and where the whole machinery of the Act was working more smoothly than any of them appeared to anticipate, was fairly satisfactory; that in the Bacon situation the initial difficulties of the launching both of the Pigs Marketing Board and the Bacon Marketing Board had been surmounted, and that they were going ahead upon the planned programme of production under the contract system lasting till the end of the current year; that, in the case of Hops, negotiations were being carried on in the friendliest spirit. In the sheep situation, arrangements as to imports made as the result of the Ottawa Agreements had worked well; a considerable rise in the prices of sheep products had taken place, and the rise in the retail market had been so slight that the consumers' voice had practically been unheard—there had been no complaint of prejudice to the consumers. The glasshouse industry continued to expand, and the contention was fully justified that, given a reasonable opportunity of making a living, British capital and industry would flow in a torrent into the industries connected with the land. It would be wrong to say that all these things were nothing if he could not make a pronouncement on the beef situation. In any normal year, such a survey of the agricultural situation would make a resounding statement by any Minister of Agriculture to that Council. It showed the scale on which they were operating, the speed of the problems before them, that those things had been taken in their stride as merely normal day-to-day administration, and that the industry was eagerly reaching out for new fields to conquer. The Milk Board, with all its difficulties, was on its feet; the recent elections, whatever their result, whoever they elected and defeated, showed that the producers were taking an immediate active interest in the affairs of their Board, and were beginning to realize the responsibilities of co-operation. As for the Government's part, that was shown in the Bill which was at present before the House of Commons, by which a bottom was to be put into the market for manufacturing milk, and by which, for the first time, a real campaign was to be started to clean up the herds of the country, and also to connect the mass producer, which the Milk Board represented, with the mass consumer which the schools of the country represented, thus disposing of the surplus milk in the most satisfactory way to all concerned,

COUNCIL OF AGRICULTURE FOR ENGLAND

viz., by getting those consumers who needed it most to drink it.

These were matters under active consideration every day, and success depended upon the sympathy and understanding of the towns for the country. With each successive step to remedy the position of agriculture, they must allow for a certain slackening of that interest, and a certain falling off of that sympathy. Hence arose the necessity for showing to the country as a whole that the benefits derived from the agricultural policy were not being restricted to the farmer alone, but were being shared throughout the whole industry, and that an improvement in wages and an improvement in working conditions were also taking place as a result of the efforts that were being made to stabilize and improve the position of agriculture. He pointed out that between the years 1925 and 1930-1 there had been, as shown by the Census of Production just published, an enormous shrinkage in capital values in agriculture and in the annual value of the produce returned from the land. The estimated value of the agricultural output in 1925 was £233 millions and in 1930-1 was £202 millions, a decline of 13 per cent., and during that time—six years—100,000 men left the land to reappear either on the employment or the unemployment lists in the towns, pressing more heavily upon the housing situation, upon the employment situation and upon the whole social conditions of the towns. During that time, from 1926 to 1931, while that great drop in prices was taking place, while that great shrinkage in capital values was taking place, a shrinkage of something like £250 millions, agricultural wages remained steady. The general index-figure of agricultural prices fell from 159 in 1925 to 120 in 1931, a fall of 25 per cent. The cost of living also fell, and the whole of the weight of that long-continued movement could not be withstood indefinitely. The repercussion upon the position of the agricultural worker was felt, as it was always felt, with a lag, and the pressure came on between the years 1931 and 1933. During that time, thirty out of the forty-seven Wages Committees made reductions in the weekly minimum wage and twelve made increases in hours. On that it was impossible to hold the sympathy of the towns; he welcomed, therefore, more than he could say the fact that since that time, since June of 1933, there had been no reductions, except in one belated case, and there had been increases of minimum rates by thirteen Com-

COUNCIL OF AGRICULTURE FOR ENGLAND

mittees, and reductions of hours by nine Committees. That enormously eased his position when he was putting the case of agriculture to the House of Commons and, still more, to the country, where he had to gain and hold the sympathy of the urban populations if the agricultural policy was going to be a real continued policy and not merely a flash-in-the-pan. The number of agricultural workers in the 26 administrative counties concerned was about 340,000 people, the equivalent practically, to the whole of the cotton spinning and weaving industry. That showed that if the money was in the industry the worker would get it.

At the last meeting of the Council he had said that he took it as an instruction from the Council that it was the beef man's turn, and within a fortnight he had followed that statement by a cut of 50 per cent. in the Irish fat cattle, by the standstill on additional Canadian cattle, and by the standstill on additional Irish stores, a step which, both on our financial relations with the Irish Free State and on our trade position, had important repercussions; and unless we could maintain the goodwill of the towns, drastic steps such as these would be totally out of the question, and drastic steps such as these were what must be applied if they were to save the beef situation. Drastic steps would be necessary and he, for one, would not shrink from applying them.

In conclusion, the Minister said: "The difficulties which are before us will require strong measures. Let us be united. Do not let us yield to those who, whenever difficulties arise, call out that they have been betrayed by their leaders. Trust in one's leaders is most difficult when we are having a difficult time. It is easy enough to trust in the leaders when everything is going well, but when I come down to you, as I do to-day, and say to you there is no message I have to give you about beef—I am applying every ounce of energy and thought that I can to the solution of the present problem; my colleagues are applying every ounce of energy and thought they can give to the solution of the present problem; but you must trust and you must believe that, when we say we are doing these things, we are doing these things—then I put the heaviest test upon a democratic assembly that it is possible to ask them to undergo. Very well, I ask you to undergo that test. I say to you—you have got to continue to believe that we are working upon this problem and that the actions that we

COUNCIL OF AGRICULTURE FOR ENGLAND

have taken in the past are the only test that we can give you for our actions in the future. There are those in the hall here who will find that a difficult message. There are those of you who are confronted with grave situations on the farms, with falling receipts, with lower capital values, with the difficulties which I recognize as well as any of you, for after all I share those difficulties not merely as a Minister but as a farmer, and I myself feel the weight of these shrinking values as much as anyone in this room. I have said to you that we are not in a position to make a statement. That is the ultimate test I can make of you, and that is the ultimate test that you can make of me, and for that reason I come down to you personally to make that statement before you and to stand and hear the criticism or accusation you wish to make to me as a result of that, the frankest statement that it is possible to me to make to you this morning."

MR. DENTON WOODHEAD congratulated the Minister on bringing into his statement so notable a reference to the workers' side, and called attention to the fact that a man in another employment in which he qualified for unemployment insurance would get 37s. for doing nothing as against 32s. 6d. a week as an agricultural labourer if he were employed. He pressed two points on the Minister—the first, that agricultural wages should be well maintained on a fair level with retail prices and, second, that an unemployment insurance scheme should be worked out. MR. J. BEARD supported Mr. Woodhead's plea. He thought that if the land were fully and properly cultivated and more employment given, the country would be saving its taxation and, in addition, saving the morale of the men who, being unemployed in agriculture, are nowadays asked to accept 15s. a week on a relief job. MR. H. W. THOMAS (Hants) confessed to a little disappointment in regard to the beef situation. MR. R. P. ALLSEBROOK (Leicester) congratulated the Minister on his speech. The need, however, for something to be done in regard to beef was greater to-day than ever it was. MR. T. BYASS (East Riding) also congratulated the Minister. As regards wages, he was paying to-day 100 per cent. more than he did pre-War and his receipts for his products were probably the same. Increased wages to-day were impossible, as would be dole contributions under present conditions. Wages were, in fact, being paid out of capital. On the Minister's own showing there

COUNCIL OF AGRICULTURE FOR ENGLAND

had been a large decline in capital values. MR. J. O. ADAMS (Northants) and MR. W. W. SAMPSON (Dorset), in the course of their remarks, referred, respectively, to the increased seriousness of the position through the drought, and to the change-over which was being made in farming from grazing cattle to supplying milk. THE MINISTER replied briefly to the points which had been raised in the debate, saying that he recognized that the farmers' market had to be underpinned. The fact that the unemployed agricultural labourer had to go to the Poor Law Officer in the country instead of to the Labour Exchange was now being altered by the Unemployment Bill. It would be the immediate duty of the Unemployment Insurance Committee, when this Bill came into force, to investigate the position of agricultural workers and see whether a scheme could not be worked out under which he will pay a premium and receive a benefit. Progress in this matter would hinge on the prosperity of the industry. THE CHAIRMAN thanked the Minister for his statement on behalf of the Council.

Contagious Abortion.—LT.-COL. SIR MERRIK BURRELL, Bart., C.B.E. (West Sussex) moved the adoption of the Report of the Standing Committee on Contagious Abortion. He informed the Council that the Report of the Cattle Diseases Committee of the Economic Advisory Council referred also to this matter and that it would be considered by the Standing Committee in due course. The Committee would report more fully to the Council at a later date. The Report was adopted.

Warble Fly.—SIR MERRIK BURRELL moved the adoption of the Standing Committee's Report on the Warble Fly. The Report suggested that a campaign by farmers against the Warble Fly should be inaugurated, provided the countries which sent live stock to this country as stores (Ireland and Canada) took adequate measures to suppress the Warble Fly menace during the proper seasons of the year. Sir Merrik said that, personally, he thought the difficulty of dealing with imported cattle had been rather exaggerated. It was not an unfair thing to insist that all cattle coming into the country should be subjected to the same treatment as cattle reared in this country. The Report was adopted.

COUNCIL OF AGRICULTURE FOR ENGLAND

Bacon Indemnity Loan.—THE CHAIRMAN moved the adoption of the Standing Committee's Report on this subject. He said that the details of the loan arrangements were fully stated in it, and that the last clause summed up the situation. That clause suggested that the Council should take no action at the moment. MR. A. E. BRYANT (Bucks) said he was not satisfied with the Report and would be glad to know why a difference should be made by the factory paying less for black pigs than others. THE CHAIRMAN ruled that the question did not properly arise on this Report, which was then put to the Meeting and adopted.

Sheep Scab.—MR. DENTON WOODHEAD moved the adoption of the Standing Committee's Report on Sheep Scab. MAJOR R. B. TURTON (North Riding) and MR. JAMES HAMILTON (Lancashire) spoke on the question of the decisions of magistrates in Sheep Scab cases. The Report was adopted.

Fat Stock Trade.—SIR A. G. HAZLERIGG, Bart. (Leicester) moved the adoption of the Report from the Standing Committee on the Present Condition of the Fat Stock Industry (see Appendix I, p. 381). He congratulated the Minister on the extraordinary courage of his statement. He criticized the Report of the Reorganization Commission on Fat Stock and referred to the four alternative plans for immediate action which the Standing Committee named as being mentioned by the Reorganization Commission. He called attention to the big drop in average prices of home-killed beef per cwt. from 48s. in 1928 to 35s. 2d. in 1933, and emphasized the suggestion of the Committee that an immediate plan for a levy and subsidy for a strictly limited period should be worked out. He knew one county where wages had gone up or where hours had gone down as a result of the pronouncement, at the last Meeting of the Council, that it was now the beef-man's turn. The increase in wholesale prices had not eventuated and the industry very much needed it in order that it should be set on its feet again and the pastures well grazed and the men kept in employment. The position was that the industry had waited and waited and waited. The Minister could assure his colleagues in the Cabinet that the Council was hoping they would back the Minister in everything he did for the beef-man so that his turn might come within the next few

COUNCIL OF AGRICULTURE FOR ENGLAND

weeks. MAJOR R. G. PROBY, M.C. (Hunts) supported the Report. MR. A. H. PEARCE (Warwick) opposed a subsidy on beef as he thought that, first of all, the margin between the producer's price and consumer's price might be reduced. He saw prime beef going down to 38s. while in the villages the selling price was anything from 1s. to 1s. 4d. per lb. The butchers were well organized and rings were formed in the markets. MR. R. ANDERSON (Northumberland) assured the Minister that the position of the beef producer in Northumberland was very acute indeed. Stock and staff on many farms had been reduced. Land had gone down to grass, and cattle were being fed as a seasonal industry, which meant that there were a large number of cattle in the autumn that could not be sold. The whole thing was most unremunerative. His brother farmers thought that a scheme on the lines of the Wheat Quota, with a levy on imported beef and restrictions on foreign beef, was the right solution. MR. CHRISTOPHER TURNOR supported the idea of a levy and subsidy, even if only as a temporary measure. He hoped, at the same time, that the formation of some large scheme for central slaughtering such as the Standing Committee had approved would be started. SIR MERRIK BURRELL also supported the idea of a levy on the same plan as the wheat subsidy. He emphasized Mr. Turnor's point about the central slaughtering of cattle. On this subject, he turned to the Report, known as Lord De La Warr's Committee's Report, i.e., the Report to the Economic Advisory Council on the Slaughtering of Fat Cattle. He thought that the marketing of fat stock was not a question for a marketing board but for a proper organization of regional abattoirs and selling meat from them direct. Store cattle could be auctioned as they are to-day. If the producers got into the labyrinth of the suggestions of the Reorganization Commission's Report he was afraid that ruination would come upon them. MR. E. PEAT (Derby) opposed the central slaughtering of cattle because it eliminated competition in the purchase of fat cattle which was so much needed. At Sheffield they had a centralized slaughtering-house and before it was established 150 retail butchers would go to the market to buy fat cattle in competition, thus increasing prices and helping the producer. Now the trade was in the hands of a very few men. He hoped the Standing Committee would further consider the question. A retail man could always give more than a

COUNCIL OF AGRICULTURE FOR ENGLAND

wholesale man. MR. R. BRUFORD (Somerset) and MR. BYASS also spoke on the matter; the latter thought that some means must be adopted to eliminate the coarser meat from the market as the Standing Committee's Report suggested. It was no use selling the coarser meat without some adequate system of marking: such a system should be coupled with the levy and subsidy. The Report was then adopted.

Summary of Fat Stock Commission's Report.—The Summary was received by the Council.

Increased Vegetable Production.—MR. CECIL ROBINSON (Holland) moved the adoption of the Standing Committee's Report on this subject (see Appendix II, p. 385). He mentioned three items—potatoes, peas and onions—and stressed the varying opportunities there appeared to be for added output with each of them. The question of foreign peas canned in England was one, he said, that should be examined with the object of stopping unfair competition with home-produced canned fresh peas. He would like to see a duty of 10s. a quarter placed upon imported peas for canning. He gave figures which showed that the import duties had had the desired effect—11½ million pounds' worth of vegetables imported in 1931 as against 6½ only in 1933. The position at the moment was not stable owing to the fact that the industry did not know what steps the Tariffs Advisory Committee were going to take in the autumn. He thought that the Committee should try and make these duties permanent, or at least definite for three years. A MEMBER inquired as to the influence on the question of vegetable supply of the large increase in the number of allotments. MR. ROBINSON said that that influence was an unknown factor as holdings under one acre were not recorded. The Report was then adopted.

Home-killed Meat for the Forces.—MAJOR R. B. TURTON moved—

"That the Council of Agriculture for England deplores the fact that His Majesty's Forces are still supplied with imported meat and that in the interests of the 'Buy British' Campaign and to assist English farmers during this period of depression in the live-stock industry the Council makes strong representations to the Government to buy home-fed meat for His Majesty's Forces."

The mover gave a short history of the efforts that had been made to convince the Government that the Forces should be supplied with home-killed meat. It was estimated that the annual extra cost of supplying such meat to all

COUNCIL OF AGRICULTURE FOR ENGLAND

Home Forces would be over £400,000. It was hardly fair of the State to impose regulations on the farming industry and then to say it was impossible to buy its products. Despite the fall in beef prices to-day, the housewife was paying the same price to the butcher. With home-killed meat for the Forces there should be no middleman's profit and the wholesale price was surely low enough. MR. ANDERSON, seconding the motion, thought that if the Forces were supplied with home-killed meat, even only in October, November and December, the situation would be materially helped. BRIG.-GEN. H. CLIFTON BROWN, M.P. (West Sussex) submitted that this question should be reserved as there were far better things on the *tapis* at the moment for the industry. It was, in his view, inadvisable to press it at present. MR. BEARD supported the resolution because it was so small a thing and he thought it no more than ordinary common sense. He also asked that farmers who sit on county councils and who administer public assistance institutions should provide English meat wherever they had control. At present they were not doing it. They could start the movement at home and see that orders are given for English-produced beef. He called attention to the experiment made by the Maidstone Public Assistance Committee which had led to it recommending English beef on the ground that the loss was less in cooking than with foreign meat. LORD CRANWORTH, M.C. (East Suffolk) called attention to the fact that if the meat imported for the Army were displaced, it would still come on the English market as part of the existing quota. MR. A. MATTHEWS (Hereford) and MR. BRYANT also supported the resolution. In the course of the discussion, it was proposed and seconded that the wording of the last line of the resolution, after the word "Government," should be amended to read as follows:—"that, in addition to other and greater measures for helping the beef industry, they should supply home-fed meat for His Majesty's Forces." The amended resolution was put to the Meeting and carried.

County Veterinary Services.—MR. C. H. ROBERTS (Cumberland) moved—

"That the Council welcomes the Government's proposal for the elimination of disease from herds and would desire its further explanation in detail. It hopes that County Councils might be able to co-operate by utilizing and, where necessary, extending their veterinary services so as to provide for any necessary inspection that may be required."

COUNCIL OF AGRICULTURE FOR ENGLAND

Mr. Roberts said that, since the resolution had been put on the Paper, a certain amount of information had become available. He would, however, like to have information on certain other questions: (1) Was any part of the £750,000 to be spent in the next four years? (2) Was any part of it going to help the establishment and extension of the veterinary service in the Counties? (3) If the £750,000 was all to be spent on premiums for tested milk in the next four years, would the Milk Board be called upon to pay such premiums afterwards? (4) Would examination fees still have to be paid by accredited producers for licences? He would like to see such fees abolished. (5) Were the Hopkins' series of grades to be adopted instead of the existing series? THE CHAIRMAN then drew attention to the fact that Lord Cranworth's resolution, which was as follows:—

“ That the Ministry be asked to consult with this Council before coming to a decision as to how to expend the £750,000 to be voted to assist the cleansing of the milk supply of the United Kingdom.” dealt with the same subject and that, in addition, there was the recently issued Report of the Economic Advisory Council's Committee. He suggested that all these matters dealing with the milk supply should be referred to the Standing Committee.

LORD CRANWORTH said he was in such a case ready to withdraw his resolution and he agreed that the matters should be referred to the Standing Committee. He thought that the Council and the Committee were doing a great service to the industry. MAJOR MUIRHEAD, speaking on behalf of the Ministry, said that the various questions put by Mr. Roberts had been noted. Many of the subjects had been dealt with in the debates on the Milk Bill in the House. He thought that everyone would agree that more time was required to consider them and he was pleased that they should now be referred to the Standing Committee of the Council. He entirely endorsed what Lord Cranworth said, as to the value of the Council and its Standing Committee, and he was certain the Minister would be only too glad to consult with the Standing Committee on these questions. SIR MERRIK BURRELL agreed with the reference to the Standing Committee, and as a member of the Economic Advisory Committee he would be very ready to be cross-questioned on the Report by the Standing Committee, of which he was also a member. The course proposed by the Chairman was then agreed, and the two resolutions stood referred to the Committee.

COUNCIL OF AGRICULTURE FOR ENGLAND

APPENDIX I

BEING A REPORT FROM THE STANDING COMMITTEE OF THE COUNCIL OF AGRICULTURE FOR ENGLAND ON THE PRESENT POSITION OF THE FAT STOCK TRADE

1. The Standing Committee have considered the Report of the Reorganization Commission for Fat Stock and desire to make the following observations on it in connexion with the present position of the fat stock trade.

2. The Report, whilst recognizing the perilous position of the live-stock industry, does not make any strong recommendation for immediate improvement. It rather hopes that, with the comprehensive scheme of internal marketing reorganization which it recommends put into force, coupled with such further import regulation as may be required, the industry will find itself on its feet again. It is clear that the Commission are particularly anxious to avoid the risk of the high retail prices that would be induced by scarcity, and home producers are urged to seek improvement in the methods of producing store stock and to market their beasts more cheaply and efficiently. The Report adds (para. 30) that if the main measures it suggests fail to restore prices, then it would be necessary to consider supplementary methods, of which it says "the four most frequently mentioned are an import duty, a levy on the lines of the Wheat Act, an import board, and a direct subsidy. Of these four, the one which we would recommend to the first consideration of the Government is the levy plan, although this may not be immediately practicable owing to treaty arrangements. A levy, whatever may be its effect on wholesale prices, would provide a fund which could automatically be applied to the relief of the home producer."

3. The Commission also recommend, *inter alia*, the extension of the National Mark beef scheme on the lines on which it is now operating (paras. 97 and 121) and the encouragement of sale by grade and deadweight (paras. 98 and 121). The Standing Committee are of the opinion that those recommendations are inadequate to meet present needs for the improvement of marketing technique. In its Report to the Council on Better Marketing of Live Stock and Meat, December, 1928, the Committee themselves recommend the application of the National Mark system to English meat, anticipating therefrom immense advantage to producers in their marketing. The Committee have watched the development of the National Mark scheme in relation to beef with great interest, and they appreciate its recent extension to additional areas and its general development. The Committee have also watched with considerable interest the extension and development of the system of sale by grade and deadweight of sheep and lambs and pork pigs under the auspices of the Markets Branch of the Ministry of Agriculture. The Committee also note the suggestion of the Reorganization Commission that actual grading should continue to be done by officers employed by the State, and their hope that as the system of sale by grade and deadweight develops, the Board, under the proposed Live Stock Marketing Scheme, will create the necessary machinery for the transfer in bulk of live stock for sale in this manner.

4. This is encouraging, but in our view it does not go far enough, especially as regards beef. The Reorganization Commission state that the volume of cow beef is now believed to be one-third of the total supply of home-fed beef (para. 86). As regards England and Wales, this appears to be in the nature of a minimum estimate, if in fact it is not an underestimate. The Report of the De La Warr Committee*

* Committee of the Economic Advisory Council, Report on Slaughtering of Live Stock, 1933.

COUNCIL OF AGRICULTURE FOR ENGLAND

on the Slaughtering of Live Stock gave the following figures for the numbers of cattle slaughtered in *England and Wales*.

ESTIMATED AVERAGE NUMBER OF CATTLE FATTENED AND SLAUGHTERED IN ENGLAND AND WALES ANNUALLY IN THE PERIOD 1924 TO 1928.

	<i>Numbers in thousands</i>	<i>Per cent.</i>	
		<i>English</i>	<i>English, with Irish Stores Fattened</i>
Cows	600	57	47
Steers and maiden heifers	387	38	30
Baby beeves	30	3	2
Bulls	21	2	1
 Total home-produced	 1,038	 100	 80
 Irish imported as stores	 256	 —	 20
 Total fattened and slaughtered	 1,294	 —	 100

5. In addition to these numbers of stock both fattened and slaughtered in England and Wales, there were at this period a considerable number of fat cattle imported mainly from Ireland and then slaughtered in this country. Allowing for these cattle, it appears that the number of cows and bulls amounted to about 37 per cent. of the total of cattle slaughtered in this country; but, as shown above, about 47-48 per cent. of the cattle both fattened and slaughtered in England and Wales consisted of cows and bulls. The position has not improved since 1928, and as the proportion of dairy cows in the total herd of the country has increased it may become worse. According to the best information obtainable the number of cows and bulls has recently represented 38 per cent. of the total cattle slaughtered in this country.

6. The Standing Committee cannot approve of the presentation to consumers of such high and increasing proportions of beef obtained from cows and bulls without any system of distinguishing this meat from the beef obtained from steers and heifers fattened, and to a large extent bred and reared, for the beef market. Some of the beef obtained from cows and bulls passes to the cooked meat trade, but it is within the knowledge of members of the Committee that large quantities are presented to consumers through the shops without carrying any distinction from the better beef and without any warning to consumers.

7. The Standing Committee note the statement that the Reorganization Commission for Fat Stock consulted persons in the canning industry and arrived at the conclusion that "the canning of low-grade beef would not be an economic proposition" (Report, para. 102). This may not exhaust the possibilities, for the trade in prepared and cooked meats is increasing, and uses other than canning may be found for much of the low-grade beef. If, however, there is no outlet for large quantities of cow and bull beef other than in the fresh form, it is essential that producers of steer and heifer beef shall receive a due measure of protection against unfair competition and that consumers shall be protected against unfair treatment in their purchases. The interests of consumers and of producers of the higher-grade beef coincide and they deserve whatever measure of protection it is possible to afford them.

8. The Standing Committee further note the statement of the Reorganization Commission for Fat Stock that:

"It has been suggested that one of the chief causes of the low

COUNCIL OF AGRICULTURE FOR ENGLAND

prices of cattle has been the depressing influence of heavy supplies of low-grade beef (cow and bull beef) on the market." (Report, para. 102.)

They agree with that suggestion, and would also add that the decline of beef in public favour is largely due to the same cause. The Reorganization Commission point out that from the pre-war (1909-13) to a recent period (1927-31) total meat supplies in Great Britain increased by 17 per cent., while population increased only about 8.9 per cent. (Report, para. 6), and that the downward course of prices has been closely associated with the increase in imports. This is the general position, but for a clear understanding of the present condition of the beef market in particular it is necessary to remember that recent supplies, both in total and per head of population, have been lower than in former years.

9. It is difficult to discover the actual pre-War consumption of beef, but the consumption of *beef and veal* 1909-13 was about 65.66 lb. per head of population.* On the figures given by the Reorganization Commission the consumption of beef and veal in the years 1927-31 would be about 68.69 lb. per head. Up to this time, however, the really disastrous fall in prices had not occurred, as the figures given by the Commission show (Report, para. 20). As the Commission provide figures which make possible the calculations of the approximate consumption of beef per head of the population, it is instructive to compare the total supplies, amounts per head, and prices in recent years.

	(1) Total supply of beef. (million cwt.)	(2) Approximate amount per head. (lb.)	(3) Prices.		Index 1911-13 = 100
			Per cwt.		
			<i>s.</i>	<i>d.</i>	
1927	27.3	69 - 70	44	3	127
1928	26.9	67 - 68	48	1	138
1929	26.5	66 - 67	46	5	133
1930	26.2	66 - 67	46	2	133
1931	25.8	64 - 65	42	7	122
1932	24.4	60 - 61	39	11	115
1933	—	—	35	2	101

(1) Report of Reorganization Commission, Table 4, p. 91.

(2) Calculated.

(3) Report of Reorganization Commission, para. 20, p. 23.

When these figures for supplies in total and per head of population are compared with prices, there cannot be any doubt that there are influences tending to turn the consumers away from the beef market, and amongst these influences the Standing Committee would put first the unregulated or undistinguished supplies of cow and bull beef. Consequently, the Standing Committee are of the opinion that the time has arrived when the supplies of fresh beef from cows and bulls offered to consumers should be clearly distinguishable. They are of opinion that the National Mark System, as now followed, affords inadequate protection to producers of steer and heifer beef, and to their ultimate customers, the consumers; and that every possible step should be taken to secure universal marking of qualities of beef. This would be in accordance with the general principle of protection of producers of the finer quality article against the substitution of a poorer quality, and of assuring to producers of the higher qualities the

* Economic Series, No. 20. Report of Marketing Cattle and Beef. P. 153.

COUNCIL OF AGRICULTURE FOR ENGLAND

premium to which they are entitled. It is noted that an Order is now before Parliament requiring the marking of imported meat (beef and mutton). That is all to the good as it clears the way for the reforms in marking our own home-killed meat on the lines of the suggestions made above, and otherwise.

10. It is possible that the necessary marking of home-produced beef might be obtained by universal requirement of marking of all home beef, or by requirement of marking of cow and bull beef only. The methods require further consideration.

11. In this connexion, the Standing Committee would again recall that in its recommendation of the application of marking to beef (Report to Council, December, 1928), it stated that the scheme would be facilitated if cattle whose meat could be graded could be killed in central abattoirs rather than in private slaughterhouses. Since this time there has been much development of information and thought on the slaughtering of fat stock. In 1933 Lord De La Warr's Committee on Slaughtering of Live Stock provided a great deal of information and set forth many considerations on the subject. This Committee recommended, *inter alia*, the establishment of a statutory non-profit-making body, to be known as the National Slaughterhouses Board, which would have the power to prohibit the erection of new, or alteration of existing slaughterhouses by public authorities; and should either prepare regional schemes for joint boards of local authorities, for which the National Slaughterhouses Board would itself provide finance; or regional schemes to be undertaken by associations providing their own finance.* The Standing Committee have noted the appointment of a Technical Committee to study the technical requirements of the factory abattoir under the Chairmanship of Sir Francis Boys. Also that the Reorganization Commission for Fat Stock state:

"We consider that further centralization of slaughtering facilities is inevitable and desirable in the interests of the home live stock and meat industry, but we think the development should follow a long-range plan. To this end we recommend the establishment of a National Slaughterhouses Commission as an advisory and planning, but not executive body." (Report, paras. 95 and 121.)

12. The Standing Committee are aware of the many difficulties surrounding this subject but they recognize that the development of the system of wholesaling in the meat business, the necessity of selection of qualities and even "cuts" of meat for different consuming markets, and, above all, the necessity of making provision for the widest possible extension of the system of grading and marking meat, especially beef, make its practical consideration a matter of urgency. They regret that the Reorganization Commission, regarding further centralization as inevitable, could not see their way to recommending a form of organization for development which would bring early efforts to meet the needs of producers. They are of opinion that development of central slaughtering, with consequent provisions for grading and marking, are essential to the protection of producers of the higher qualities of beef in England and Wales. While the Committee appreciate the efforts being made to maintain the price of beef amongst other home-produced meats, they are of opinion that special efforts are necessary in the case of beef to protect not only producers but also consumers, and to recover for "the roast beef of Old England" that public appreciation which its better qualities fully deserve.

13. The Standing Committee also note the recommendation of the Reorganization Commission that the Board of the proposed Live Stock Marketing Scheme shall conduct publicity or educative campaigns on the merits of home-fed meat, and that the Board shall explore with the retail trade the possibilities of educative work on the uses and values of the cheaper joints of meat (para. 105). While the

* Report, p. 91.

COUNCIL OF AGRICULTURE FOR ENGLAND

Standing Committee are in thorough agreement with these suggestions, they wish to state their opinion that in the case of beef the grading and marking of qualities indicated above will be a condition precedent to any effective campaign of publicity for increasing demand.

14. The Committee, in conclusion, would suggest in order to cover the beef-producing industry during its effort to re-establish itself on a paying basis, that a subsidy or a levy and subsidy planned for immediate application and for a strictly limited period should be worked out. If the levy is used, then differentiation might be made between Empire and foreign importations, and if the levy is placed on all supplies of beef—home-produced and imported—then there might be differentiation also as between first and second quality beef in the amount of the levy. In giving any such assistance to the industry, it is suggested that the scheme should make a difference also in subsidy as between the qualities, and that the lower grades of dairy cow beef should not participate.

June 1, 1934.

APPENDIX II

BEING A REPORT FROM THE STANDING COMMITTEE OF THE COUNCIL OF AGRICULTURE FOR ENGLAND ON INCREASED VEGETABLE PRODUCTION

1. On two or three occasions in recent years the Committee has reported to the Council on the question of improvement in vegetable production in this country. These reports were rather from the angle of showing what had been done and was being done as a result of existing import duties. The Committee considers that the time has now arrived to take stock of the whole position, with a view (1) to see whether small holders and market gardeners can safely go further with the growing of certain vegetables without the risk of over-supplying the home market; and (2) to discover with what vegetables there is still ample room for expansion.

2. It may be said at once that these inquiries do not in any instance necessarily give absolute results inasmuch as three unknown factors common to all cases are brought into consideration: first, the possible variation from time to time in home consumption of any article; second, the possible variation in imported supplies notwithstanding existing tariffs; and, third, the possibly considerable seasonal variation in production in this country through abnormal climatic or pest conditions. It would, however, undoubtedly be useful if we could state figures showing present normal home-grown supplies side by side with present normal total requirements. Where no detailed figures are available, we must fill the gap by piecing together such information as comes to us.

3. It is at this point that we realize how extremely important to the producing industry are (1) accurate statistics of supplies and prices, and (2) a central controlling board, acting on behalf of producers, which will as part of its general business of improving organization inform them of the up-to-date position of their industry.

4. The following vegetables—those under (A) being already the subject of National Mark schemes for controlling the packing and grading of selected produce on the market, and those under (B) not yet being the subject of such schemes—appear to be already in sufficient supply upon the home market:

COUNCIL OF AGRICULTURE FOR ENGLAND

A

Watercress
 Green Bunched Onions
 Rhubarb (forced)
 Celery
 Cabbage and Cabbage Greens
 (excluding Red Cabbage)
 Brussels Sprouts
 Leeks
 Runner Beans
 Swedes
 Parsnips
 Red Beet

B

Mustard and Cress
 Sea-kale
 Savoy
 Scotch Kale
 Sprouting Broccoli
 Turnip Tops
 Broad Beans
 Vegetable Marrows
 Jerusalem Artichokes

5. Where there is still some small importation of any of the vegetables mentioned in the last paragraph, it is to be expected that it will gradually disappear as our home producers become fully efficient suppliers of their own market. With regard to all these vegetables, however, it should be realized by individual growers, in the absence of any central controlling authority, that extensions of acreage can only be made at the risk of over-supply, and, if a market has been secured in advance, by pushing the produce of other growers into surpluses, with the probability of glut, and a consequent reduction of prices all round.

6. The crops in which our home production falls short of home requirements, at some period of the year at least, appear to be the following:

National Mark Schemes.

Cabbage Lettuce
 Radishes
 Asparagus
 Mushrooms
 Cauliflower and Broccoli
 Green Peas
 Early or French Beans
 Onions
 Carrots
 Turnips
 Horseradish

Non-National Mark Schemes

Early Potatoes
 Endive
 Red Cabbage
 Chicory
 Dried Peas

7. *Cabbage Lettuce*.—The home supply during the late spring and summer is usually amply sufficient, tending indeed to gluts in June and July, but the supply in winter and spring is at present all too little. It is in the winter and spring that we import considerable quantities, and our pioneer glasshouse growers of market garden crops have been considering how far these imports may be substituted by home producers. Furthermore, the Lea Valley Research Institute has helped the forward movement considerably by breeding a plant that will mature under glass with proper cultivation in days of less sunlight than any pre-existing kinds. It is stated that under normal conditions this plant (Cheshunt Early Giant) grown in glasshouses will heart up three weeks before the other varieties. By sowing seed in boxes about the middle of September and planting out under glass at the end of the first week in October, maintaining the temperature at about 50°F., the lettuce will be ready for market before Christmas. Other sowings can be made in series up to the middle of December. Artificial heat under glass will be needed at latest in January so as to maintain the temperature to 50°F., and crops can be taken up to the end of March, which is the latest date for planting for the tomato main crop. Careful and correct methods of cultivation are of course essential or the crop will fail. There must be an ample water supply, and sterilization of the soil is helpful in preventing *Botrytis* rot. The Cheshunt Research Station, we are informed, will gladly furnish growers with advice on the question of proper cultivation and, as

COUNCIL OF AGRICULTURE FOR ENGLAND

far as they can, supply seed of the Cheshunt Early Giant to subscribing members of the Station. A large quantity of lettuce for the early market is grown also under glass lights. The seed of suitable varieties such as Gotte à force, May Queen or Cheshunt Early Giant is sown in frames about the middle of October and planted out in glass lights 8 inches apart early in January, and is usually ready for the market during March and April.

It is on such lines as these that the way opens out for an effort by producers on a broad front to supply the approximately £300,000 worth of lettuce which it is estimated we import in the winter and spring of each year.

8. It is the case with all these crops that standardization of production—the growing of the variety or varieties the market wants—and standardization of the produce grown when it comes to presenting it on the market are factors of the greatest importance. As we have said before, it is not possible for our produce to hold its own in the large industrial markets even in those cases where it is well known to be superior in quality, unless it is packed and graded in a manner which pleases the eye, first of all, of the wholesaler; next, of the retailer; and, last and most important of all, of the consumer, as much as, or more than, does the pack of imported produce.

9. *Radishes*.—There is room for the increased growing of this crop under glass to supply the markets in the winter and spring. Here again due standardization and proper packing, preferably under National Mark packs, are essential to success.

10. *Asparagus*.—Advance has been made in many parts of the country in the cultivation of asparagus, a crop which would permit of considerably more expansion if the home canning industry could compete more successfully with U.S. imports. The duty on fresh asparagus is 4d. per lb. between January 1 and June 30, and thereafter 10 per cent. *ad valorem* throughout the year. The value of the 1933 importation of the fresh vegetable is estimated at about £50,000.

11. *Mushrooms*.—Advance in mushroom culture has been very striking, numerous instances having come to our notice of growers newly taking up this crop. The cultivation would, we think, go forward even more rapidly if adequate supplies of the right kind of manure were available. There would not appear to be much room for further expansion if the import figures alone were taken as a guide, but in this case, in which home consumption can be so considerably increased if the supply is good and the price low, we do not think that imports need be so much regarded; their estimated value in 1933 was about £7,500 only.

12. *Cauliflower and Broccoli*.—Considerable strides have been made in increased cultivation, especially in the South-Western and South-Eastern parts of the country and in other districts where the National Mark Scheme for cauliflower and broccoli has been adopted. The imports have already been reduced by two-thirds, and this decline, largely on account of the tariff, has been more than made good by increased home production, so that there may be some slight risk now of approaching over-production in favourable growing seasons. At the same time, there is some evidence that the improved quality of the product on the market has increased its consumption. Then there is the possibility also of a greater growth of home-grown cauliflowers for pickling. A special sort of cauliflower, we are informed, is required for this purpose, and at present much of it is being obtained from abroad. There seems no reason why vegetables of the right grade and price should not be grown at home to meet the requirements of this trade.

13. There is a definite seasonal increase in imports of cauliflower at the period when the broccoli season ends and cauliflower begins. It should be possible to bridge this period by the supply of early cauliflower raised in winter under glass and planted out, and pioneer growers in the Evesham district and in South Lincolnshire are, we

COUNCIL OF AGRICULTURE FOR ENGLAND

understand, already exploring that field. The importation of broccoli and cauliflower in 1933 was about £100,000 worth.

14. *Fresh Green Peas*.—There is a comparatively small importation of green peas early in the season before our own earliest peas come on the market. To meet the home demand these early imports seem unavoidable. There are, of course, always the best canned fresh picked peas, which consumers are finding sufficiently good to take the place of the fresh article for most occasions. The value of the importation of green peas was estimated at about £27,000 in 1933.

15. *Kidney Beans*.—A portion of the crop is produced under glass in this country and is supplemented by supplies from the Channel Islands. The estimated value of the importation of all green beans in 1933 is about £36,000.

16. *Potatoes*.—There are still considerable importations of potatoes amounting to over £2 million worth. These are nearly all new potatoes imported in the spring and summer months. There is a differentiation of duty between new and old potatoes during the months from November 1 to June 30, the former being 4s. 8d. per cwt. against the latter's £1 per ton. There is obviously ample scope for increased supplies of the earliest kinds of new potatoes grown in this country. The supply to the trade of "chip potatoes" should be an easy matter for our own producers. The trade has only, we think, to specify its requirements, and there should be no need for contracts for these potatoes to go out of the country.

17. *Onions*.—There appears to be more prospect of successful increased production in onions perhaps than in any other crop at the present time. The importation in the last three years has exceeded 10 million bushels each year, and the value in 1932 was £1,800,000 and in 1933 £1,240,000. There appears to be a good case for an increase in the existing duty of 10 per cent. *ad valorem* with a view to assist the home producer to increase the acreage, for which it is estimated that 20,000 acres would be required to supply the total amount coming into the country during the period when home supplies might be made available. The question of additional employment which would be given by such an extension is particularly important in the case of onions, a crop which needs very thorough cultivation and much hand labour. The chief business for the producer here is to ascertain the kinds of onions which the market requires for table use and pickling and to grow them on suitable soils in this country. In some districts where onions have been grown too frequently the soil has become "onion-sick," so that in any case there is need to explore the possibility of opening up new districts for the crop.

18. *Carrots*.—There is as a rule a fairly considerable importation of early bunched carrots from April to July and sometimes carrots in bags after Christmas, but in general the supply is home produced. The industry is already active in regard to the supply of earlier young carrots for the late winter and spring markets. The value of the total importation in 1933, including new and old carrots, is estimated at about £140,000.

19. *Turnips*.—The importation of turnips is now not above about £3,000 in value.

20. *Horse-radish and Kiln-Dried Chicory*.—Both these vegetables come under the 10 per cent. *ad valorem* duty, and the small amounts that are imported might easily be grown in this country. As regards Witloof chicory, that is entirely imported and is a small holders' crop in Belgium. The opportunity for growing it here is being explored.

21. *Endive*.—This vegetable is also imported mostly from Belgium. There appears to be ample scope for the growing of it here, though market conditions must be studied beforehand so that the supplies may be sent in the condition the market wants them.

22. *Red Cabbage*.—Here again the imports are substantial. The product is used by picklers for preservation in vinegar, and there seems no reason why the imports should not be displaced by home supplies of the right type grown in existing winter cabbage areas.

COUNCIL OF AGRICULTURE FOR ENGLAND

23. *Dried Peas.*—The importation of dried peas is very extensive indeed. In 1933, the value of peas not fresh, i.e., dried peas, was somewhat under £1½ million, representing about 80,000 tons. Probably not more than a half of these were used for human consumption, but of them an increasing quantity is being imported for the purpose of processing and subsequent canning, when they are sold as "British canned peas" at a price cheaper than it is possible to sell fresh-grown canned peas under the National Mark and otherwise. Although it is true that the consumer has a defence against being misled by these imported peas if he makes sure that the British canned peas he is buying are National Mark fresh green peas (i.e., peas certain to have been grown in this country and canned fresh from picking), we do not think it is right that he should be allowed to be so misled. By attractive labelling these foreign dried peas, which are afterwards soaked and canned here, are made to look from the outside of the tin like the best British fresh canned peas. They must tend, therefore, to spoil the market of that very excellent product, and it is submitted that some law or regulation should be made whereby the fact that produce is imported is clearly stated on the can. If this for any reason is not practicable, all fresh peas of home origin that are canned should be made to bear the National Mark, and a strong propaganda campaign conducted amongst housewives and others to inform them of the true position in this matter.

24. The Committee hopes that these observations will assist growers to decide whether it is or is not desirable to extend the growth of vegetables of any particular variety. Obviously, each step forward must be made with care and caution, both as regards right methods of cultivation on the proper soils and after inquiry as to the requirements of various markets. It is not good business to take a chance by producing a crop for which there is no certainty of sale. It is understood that canners are prepared in suitable cases to enter into contracts in advance of growing, particularly in regard to the green pea and dwarf bean crop, and farmers will do well to take every advantage of such opportunities. In a district of small holders, whose land is suitable for certain early or special crops, they should not hesitate to get together and work towards a plan of combined better marketing. In most counties the Horticultural Adviser of the County Council is able and willing to give them useful advice on the best growing and business methods. It is clear that in the case of an association of small growers, a common packing or processing shed which can be used in the grading and packing of their produce to National standards will be almost a necessity. There may be many of these required over the country, and possibly also other items involving capital cost and necessary to good cultivation, e.g., up-to-date machinery, seeds and comparatively expensive fertilizers. There seems to the Committee no reason why assistance by way of loans, either direct from the Government or from a future marketing board's funds, should not be available in the early years of additional horticultural enterprise to enable a community of growers to develop their local resources to the uttermost. We are well aware that too free an availability of State money for such a purpose is undesirable and, we would add, is unsought. But if only from the point of view of providing a community of keen and able workers with an opportunity to develop their resources to the full, such facilities in our view should be made available.

25. The Committee understands that the Ministry of Agriculture will shortly issue as a number of its Economic Series a Report on the Marketing of Vegetables. This document will contain the results of several years' close inquiry and careful watching of marketing progress in horticultural produce, and should therefore prove most useful to growers, particularly in helping them towards the essential organization of their industry.

June 1, 1934.

JULY ON THE FARM

H. G. ROBINSON, M.Sc.,
Midland Agricultural College, Sutton Bonington.

AT the time of writing it is difficult to suggest what July may have in store. July is a go-between month in which anything might happen. Its importance to the farmer is usually dependent upon what has happened in June and how far weather and other prospects have been favourable to work and stock in general. Thus far the season has been an unusual one, in some respects comparable with 1933. The anticipated abundance of grass in May materialized for a short period, but fell away in June, with the result that early-mown hay crops have given a light yield owing to the lack of sustained bottom growth. The position, therefore, for winter keep is not too satisfactory, since soiling crops and spring-sown cereals have suffered along with grass. Changes in farming outlook and prospects occur so rapidly and are so much dependent upon the weather that it is not safe to conclude at this stage that difficulties are bound to crop up. It is, however, in unusually dry years that the effects of high farming are particularly emphasized, especially where an intensive live-stock policy has been pursued. The reserves of organic matter that result from heavy applications of farmyard manure are particularly valuable in this type of season. Indeed, it is sometimes necessary to be reminded that the seemingly heavy labour bill incurred in the handling and disposal of farmyard manure is not so uneconomic as is sometimes assumed. Suggestions have been seriously made that we are about to enter a cycle of dry years. If this is so, the influence on British agriculture cannot be a serious one, especially since farming systems become readily adapted to these conditions. The most serious aspect is in respect of water supplies for live stock. It has to be recognized that water is becoming increasingly necessary on the average stock farm. Modern methods of milk production, apart from the question of feeding, are making it necessary to depend upon an increased water consumption. This is seen in the extended use of milk-cooling plants, sterilizing equipment and the washing down of cowshed floors.

JULY ON THE FARM

There are usually some compensations resulting from a dry period in early summer. Apart from the superior quality of hay produced under ideal conditions, fallowing operations are usually extremely efficient. This has been well illustrated already this year, for weed control amongst fallow crops has been relatively simple. Against this, however, the season has been an extremely bad one for turnip fly attack, and early sowings of kale and cabbage have been severely affected. Whether it will ever be possible to devise a system of absolute control and treatment for this pest, time alone will show, but it is evident from accumulated experiences that three fundamental factors must be noted if serious damage is to be avoided. These comprise (1) a well-worked soil with suitable tilth and a sufficient reserve of moisture; (2) high fertility, especially in respect of immediately available nitrogen, that can be secured by the application of nitrogen before the crop is sown; and (3) the use on the seed of some agent like turpentine or paraffin. Consolidation of the seed-bed by rolling is equally important, but whether this succeeds through increasing the water content in the upper layer, or by checking underground activities of the pest is not quite clear.

In normal years in July the Eastern Counties receive a good fall of rain, though heavy thunder rain often accounts for much of this. July 15 (St. Swithin's Day) is frequently accounted a critical date for the subsequent forty days. Actually there is no support for the tradition, for in recent years there have been approximately the same number of dry days in June, July, August and September. Nevertheless, it is never very satisfactory to get caught with the bulk of hay harvest uncompleted by the middle of July. If a wet spell sets in about this time it often continues.

Liquid Manure.—The earlier reference to the increased use of water on the average farm raises another point of practical significance that is already giving rise to serious problems. The intensification of the live-stock side of farming, with a natural tendency to concentrate on cows and pigs, is not only responsible for an increase in the farm-yard manure produced, but also of the liquid manure. On most modern farms some provision exists for the collection of the liquid excreta in a large storage tank, but in ordinary farming practice it is relatively rare to find any serious effort being made to utilize this regularly. On many farms

JULY ON THE FARM

the overflow from the storage tank leads to a ditch and most of the liquid is disposed of in this way. It is, however, necessary to recognize that the authorities responsible for the maintenance of the purity of streams and watercourses are apt to investigate cases of pollution that result from farm sewage. The whole problem is a serious one, and if carried to its logical conclusion is likely to cause considerable expense both to owners of farms and tenants alike. The problem is perhaps more acute in dry years when the flow of water in streams and ditches is less than in a normal year. Thus the pollution is more marked when the effluent enters a ditch that contains only a small portion of its normal running water.

In theory the problem should be treated in the same manner as that of farmyard manure. The liquid is a by-product of live stock maintained for the production of milk and bacon; and its disposal should be as methodically practised as is that of the solid excreta. Complications do arise, however, from the fact that the hose pipe is liberally used for the swilling down of cowshed and piggery floors, so that the amount of liquid that has to be carted from the storage tank is materially increased. As a possible means of overcoming this dilution problem, arrangements have been made in some modern farm buildings for a dual system of drainage. Thus, after floors have been washed down, the diluted liquid is conveyed to a separate tank from which it can be irrigated on to conveniently situated arable land. This leaves the undiluted liquid excreta available for direct application to arable land at the appropriate season. In other instances purification by septic tanks is attempted, but this method is never a really satisfactory one, since it implies a constant wastage of fertilizing constituents that might have a marked value.

The modern problems involved make it necessary to consider the experimental work dealing with the successful utilization of liquid manure. Opinions vary greatly as to the fertilizing value of liquid manure, and as to the crops most likely to benefit from it. It is estimated that 1,000 gal. of the undiluted liquid contain the fertilizing equivalents of 3 cwt. of kainit and 100 lb. of sulphate of ammonia. Objection is frequently raised to its use on grass land because it is claimed that a rank and coarse herbage is developed that is disliked by stock. There is, however,

JULY ON THE FARM

much evidence to suggest that arable land, and particularly root breaks, benefit greatly from applications of liquid manure, and this would appear to be its proper sphere of usefulness.

Arable Operations.—Nowadays July is usually a reasonably easy period for farm horses, although much depends on the progress made with seasonal operations in June. The use of steam tackle and giant-type rotary cultivators also eases the load on horses at this time. Pin or bastard fallowing of land that has carried a crop of seeds hay or silage mixture is a very popular method of maintaining the cleanness of heavy soils throughout the Eastern Midlands. Some excellent results were secured from this method of fallowing in the summer of 1933, but giant tackle is more or less a necessity with hard-baked ground.

The principal work on root breaks concerns the use of hand- and horse-hoes for the control of weeds, and it becomes possible to check over the efficiency of the singling operation. It is always advisable to encourage the practice of a hand-hoeing after singling if conditions allow. This permits doubles to be singled, as well as the destruction of any weeds that have escaped the previous hoeing. The temptation to economize in tillage operations on the root break should be resisted if maximum cropping capacity and freedom from weed trouble is desired in subsequent crops. A certain amount of confusion exists concerning the most important effects of inter-row tillage. There are three obvious influences. Weed eradication is undoubtedly the most important, since weeds compete with the growing crop for the moisture and available plant nutrients. An experiment on the Reading University farm some years ago demonstrated effectively that hoeing was also beneficial apart from weed eradication. This is probably due respectively to the effects of forming a mulch and soil aeration. The production of a soil mulch has long been considered important. Soil temperature tests indicate the relative coolness of cultivated ground in summer as compared with hard-baked ground. Differences of opinion do arise, however, as to the influence that depth of mulch has on crop yield, and whether injury to cropping capacity is likely to arise from the cultivation of too deep a mulch by reason of the destruction of tender side roots. This question is not unimportant, but common sense would appear to indicate that once the

JULY ON THE FARM

crop has got well-established deep cultivation is not particularly necessary and might even be harmful. Experimental evidence with maize, in the United States of America, confirms the fact that shallow inter-row cultivation is superior to deep cultivation. The important point is to maintain a mulch and in so doing exterminate each successive batch of weed seedlings.

Live Stock.—July is usually an important month for live stock. On the lighter soils and more recently-seeded-down fields, pastures generally begin to lose much of their feeding value and supplementary diet may become necessary for fattening and dairy cattle alike. As in June, beef prices are normally relatively good, and therefore progressive marketing is well in evidence in grazing districts. Dairy cows are not always easy to manage this month. The tendency for yields to fall is evidence of the decline in the feeding value of the pastures, added to which the weather is not always conducive to the best results. For a month between the middle of June and the middle of July, prices of dairy cows often appreciate—a factor that reflects the difficulties experienced in keeping milk at a level output once July comes in. Whether the shrinkage in milk production will be more marked this July than in other years is not easy to decide. Suggestions have been made that many dairy farmers sought to take advantage of the higher prices in winter by increasing their output during that period, and in consequence will not be so well able to maintain supplies in late summer. This might be true of a breeding herd, but not necessarily so with the milk and feed system of dairying.

The management of dairy cows during the heat of summer calls for some special consideration. It is an old practice to house in-calf and heavy-yielding cows during the heat of the afternoon. This protects cows against the heat and flies. Considerations of this kind most certainly aid in maintaining milk output. Soiling crops are particularly welcome in districts where the pastures burn out quickly.

Sheep have justified their keep on most farms this year, and as far as the welfare of the flock is concerned this month, the main duties concern the weaning of lambs, the marking of ewes that should not be retained for breeding, and a constant watch against maggot-fly attack. In regard to the latter the regular use of sulphur and arsenic dips is a particular help, but even dipping is no sure safeguard,

JULY ON THE FARM

especially after the first fortnight has elapsed. The production of out-of-season lambs has been demonstrated recently by Stewart at the Northamptonshire Farm Institute, and in connexion with this a most interesting exhibit was staged in the Education section at the Bath and West Show. Two significant matters were demonstrated, viz., the value of the Dorset Horn breed and its crosses for lambing in the fall of the year, and the ability of this breed and its crosses to speed up the rate of production. There is evidence that agriculturists outside Dorset are impressed with the possibilities of the practice that has long been popular in this county, but it is interesting to point out that at Moulton the flock is maintained on arable crops for the three critical months of the year, i.e., until grass commences growth in spring—and in this respect the Moulton custom agrees with the recognized practice in Dorset.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended June 6				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	7 18d	7 18d	7 18d	7 18d	10 2
" " Granulated (N. 16%) ..	7 18d	7 18d	7 18d	7 18d	9 9
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20.6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium cyanamide (N. 20.6%) ..	7 5s	7 5s	7 5s	7 5s	7 0
Kainit (Pot. 14%) ..	3 6	3 0	2 17	3 0g	4 3
Potash salts (Pot. 30%) ..	5 4	5 1	4 17	5 0g	3 4
" " (Pot. 20%) ..	3 15	3 9	3 6	3 10g	3 6
Muriate of potash (Pot. 50%) ..	9 8	9 1	8 15	9 2g	3 8
Sulphate, " " (Pot. 48%) ..	10 12	10 7	10 0	10 7g	4 4
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26.27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16k	3 6
" " (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	7 15	6 17	6 15f	6 7	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 5	5 12	5 15f	5 7	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. B. MERCER, M.C., B.Sc. (*Principal*), and Colleagues,
Cheshire School of Agriculture, Reaseheath, Nantwich.

The Value of Grass.—Attention still focusses on the composition and feeding value of grass, and results steadily accumulate to show that the three summer months form the critical period of the stock-feeder's year. It is true that the economics of grass farming have altered slightly with the general fall in the value of feeding stuffs. In 1929, the economic argument could be set forth somewhat as follows:—

COST OF A DAY'S RATION FOR A 3-GALLON COW.

<i>Winter.</i>		<i>Summer.</i>
18 lb. hay at $\frac{1}{2}d.$	.. 9d.	Day's grazing at 3s. 6d.
10 $\frac{1}{2}$ lb. concentrated food at 1.1d.	11 $\frac{1}{2}d.$	per week 6d.
	1s. 8 $\frac{1}{2}d.$	6d.

Like most of the facile summations adopted (for the relief of overburdened humanity) in popular-economics, the foregoing statement was never quite true, since the cost of a day's grazing cannot be arrived at by the simple process of dividing a season's costs by the number of grazing days. It was, however, near enough to point the moral; and this calculation, or something like it, has doubtless been used as a basis of discussion in scores of lectures since the work of Woodman, on the nutritive value of pasture grass, was first published. The contrast is not now so striking, since costs of concentrate have fallen.

Farm practice, unfortunately, has not been able wholly to adapt itself to the ideal set up by Woodman, viz., that of feeding stock continuously on young short grass. Unexpected snags have arisen in the exploitation of the theory: in particular, grass has not proved such a complacent subject as we at first were inclined to suppose: it has, so to say, "views of its own" on the question of constant close grazing, these putting a limit upon our endeavours to work it too hard.

NOTES ON FEEDING

As long ago as 1928, it was found at Reaseheath that certain types of temporary pasture degenerated quite noticeably under conditions of intensive grazing. Martin Jones' recent studies suggest that, in greater or less degree, the same is true even of permanent grass. None the less, the central idea of rotational grazing of short leafage remains sound; and the present period of the year affords the farmer an opportunity for fruitful application thereof. On all large farms, grazing conditions tend to approximate to those of the ranch. In July, it is desirable to bare down one section of the grazed area either by heavy stocking or by the use of the mowing machine, preparatory to a dressing of nitrochalk or some other quick-acting nitrogenous manure. The aftermaths of hay crops—earlier now than in years gone by because of our earlier cuttings—should relieve the pressure on the reduced pasture area in August.

New Ideas on the Feeding Value of Grass.—The chemist and the botanist have been the leading figures in the grassland campaign of the past decade. There enters now the physiologist, with his homœopathic “dose” of carotene. We are told this is the principle mainly responsible for “that buttercup colour” in milk and cream. The mention of carotene may not of itself make much appeal to the ordinary milk producer, for colour *qua* colour is of minor significance in milk farming. But carotene, as the very close associate of Vitamin A, is another matter altogether. It has, perhaps, profound effect on the winter health of our herds; nay, it has, or may have, profound effect on the health of our children. It may well be that the battle of pasteurization will be fought around a standard bearing the device of carotene.

Loss of Food Value in Haymaking.—The bearing of all this, however, on farm practice lies herein. Carotene is present in considerable quantity, as such substances are reckoned, in green grass. It is largely destroyed in the normal process of haymaking, but can be preserved by rapid drying of the grass: it is almost entirely destroyed in the normal process of silage making, but is largely preserved in the A.I.V. ensilage process, and in part too, when silage is made with the addition of treacle.

That haymaking, in the ordinary way, always involved a certain amount of loss, and indeed, upon occasion, a total

NOTES ON FEEDING

loss of the food value in the grass, has of course been recognized from time immemorial, but it is only recently that scientific workers have made any attempt to determine what the normal loss really is. Most of our information comes from the Continent; but judging from the published reports it appears that haymaking normally involves a loss of something like one-quarter to one-third of the total food value, the amount depending largely on the weather conditions at haymaking time.

These losses can apparently be reduced by any process that preserves the green colour. Artificial drying does this, but artificial drying is at present an engineering rather than a farming problem; it is not surprising therefore that the next best thing, viz., the tripod system of drying hay out in the field should have evoked so much interest since it was revived a few years ago. At Reaseheath last year this method was tried out on a total area of about 15 acres. Working with pikes containing enough material to yield about a load of hay—say 10 cwt.—a good product was obtained only when the hay was half-made before being put together. It is, perhaps, possible to produce good green hay if the pikes are built with merely wilted grass, but under northern conditions at all events, they would have to be so tenuous that the labour involved in constructing them, and the number of tripods required per acre, would together rule out “green hay” as an economic proposition.

Working, however, with half-made stuff, a large quantity of moderately green hay can be made “safe” in the field in a very short time. Whether or not this fact constitutes a sufficient appeal to the average farmer depends mainly on his temperament—there is a very large body of opinion in favour of making hay harvest the occasion of a fierce concentrated onslaught with a gang of additional workers and a quick “harvest home.”

The Ensilage Method.—The A.I.V. ensilage process involves the use of large quantities of concentrated mineral acids watered down and sprinkled on to the green material during the filling and trampling process. Twenty tons were made at Reaseheath last year. One of the trampers sat on the edge of the wooden silo during a watering spell and burnt the seat out of his trousers! It may of course be argued that this was merely the just reward of laziness: on

NOTES ON FEEDING

the other hand the incident may fairly be cited as proof that the A.I.V. process in its present form involves too many risks to allow of its adoption on the average farm. Speaking for ourselves, we do not consider it "practical." Of the quality of the product, however, there is no doubt at all, though cows do not at first take it readily. As regards weight losses resulting from the process of ensilage, these proved to be in the region of 25 per cent.

Bearing on the question of carotene content, previously discussed, some colour tests conducted at Jealotts Hill with butter made from the milk of cows feeding on the silage proved interesting. A group of cows was fed for successive monthly periods on a normal winter ration of hay and mangolds, then on A.I.V. silage (32 lb. per head per day) and then, again, on hay and mangolds; and butter was made from the milk of the group during each period.

The results in brief were as follows:—

YELLOW UNITS IN BUTTER OF COWS FED ON:

<i>Hay and Mangolds.</i>	<i>A.I.V. Silage.</i>	<i>Hay and Mangolds.</i>
2.1	9.2	4.4

Other tests, carried out with butter made from cows receiving treacle silage, gave similar results. As summer milk at its best generally has 14 yellow units, it is clear that the A.I.V. silage had an effect approximating to that of grass.

TABLE OF FEEDING STUFFS

Description	Price per ton	Manu-rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro-tein equiv.
Wheat, British	£ 10	£ 8	£ 2	72	s. 5	d. 0.76	9.6
Barley, British feeding	6 0	0 8	5 12	71	1 7	0.85	6.2
" Argentine	5 3	0 8	4 15	71	1 4	0.71	6.2
" Danubian	4 15†	0 8	4 7	71	1 3	0.67	6.2
" Persian	4 17*	0 8	4 9	71	1 3	0.67	6.2
" Russian	5 3	0 8	4 15	71	1 4	0.71	6.2
Oats, English white	6 10	0 9	6 1	60	2 0	1.07	7.6
" " black and grey	6 10	0 9	6 1	60	2 0	1.07	7.6
" Scotch White	6 18	0 9	6 9	60	2 2	1.16	7.6
" Canadian No. 2 Western	6 17	0 9	6 8	60	2 2	1.16	7.6
" " mixed feed	5 15	0 9	5 6	60	1 9	0.94	7.6
" Argentine	6 13	0 9	6 4	60	2 1	1.12	7.6
" Chilian	6 8	0 9	5 19	60	2 0	1.07	7.6
" Russian	6 18	0 9	6 9	60	2 2	1.16	7.6
Maize, Argentine	4 10	0 7	4 3	78	1 1	0.58	7.6
" Danubian Gal. Fox	4 5†	0 7	3 18	78	1 0	0.54	7.6
" Russian	4 8†	0 7	4 1	78	1 0	0.54	7.6
Beans, English Winter	6 0‡	0 16	5 4	66	1 7	0.85	19.7
Peas, Japanese	19 2†	0 14	18 8	69	5 4	2.86	18.1
Dari	5 5*	0 8	4 17	74	1 4	0.71	7.2
Milling offals—Bran, British	4 10	0 15	3 15	43	1 9	0.94	9.9
" " broad	5 0	0 15	4 5	43	2 0	1.07	10
Middlings, fine imported	5 2	0 12	4 10	69	1 4	0.71	12.1
Weatings†	5 0	0 13	4 7	56	1 7	0.85	10.7
" Superfine†	6 0	0 12	5 8	69	1 7	0.85	12.1
Pollards, imported	4 12	0 14	3 18	62	1 3	0.67	11
Meal, barley	6 15	0 8	6 7	71	1 9	0.94	6.2
" " grade II	6 0	0 8	5 12	71	1 7	0.85	6.2
" " maize	5 12	0 7	5 5	78	1 4	0.71	7.0
" " germ	5 15	0 11	5 4	79	1 4	0.71	8.5
" locust bean	7 0	0 5	6 15	71	1 11	1.03	3.6
" bean	7 15	0 16	6 19	66	2 1	1.12	19.7
" fish	16 0	2 1	13 19	59	4 9	2.54	53
Maize, cooked flaked	5 15	0 7	5 8	84	1 3	0.67	9.2
" " gluten feed	5 12	0 12	5 0	76	1 4	0.71	19.2
Linseed cake, English, 12% oil	9 15	1 0	8 15	74	2 4	1.25	24.6
" " " 0% "	9 7	1 0	8 7	74	2 3	1.21	24.6
" " " 8% "	9 2	1 0	8 2	74	2 2	1.16	24.6
" " " 6% "	9 7‡	1 0	8 7	74	2 3	1.21	24.6
Soya-bean cake, 5½% oil	6 12*	1 8	5 4	69	1 6	0.80	36.9
Cottonseed cake—English, Egyp- tian seed, 4½% oil	4 5	0 17	3 8	42	1 7	0.85	17.3
" " Egyptian, 4½%	4 0	0 17	3 3	42	1 6	0.80	17.3
" " decorticated, 7%	6 12†	1 8	5 4	68	1 6	0.80	34.7
" " meal, decorticated, 7%	6 10†	1 8	5 2	68	1 6	0.80	34.7
Coconut cake, 6% oil	6 0	0 18	5 2	77	1 4	0.71	16.4
Ground-nut cake, 6-7% oil	5 12*	0 18	4 14	57	..	..	27.3
" " " decor., 6-7% oil	6 10	1 7	5 3	73	1 5	0.76	41.3
" " " imported, decorticated, 6-7% oil	5 7	1 7	4 0	73	1 1	0.58	41.3
Palm-kernel cake, 4½-5½% oil	5 17†	0 12	5 5	73	1 5	0.76	16.9
" " " meal, 4½% oil	5 17†	0 12	5 5	73	1 5	0.76	16.9
" " " meal, 1-2% oil	5 7	0 12	4 15	71	1 4	0.71	16.5
Feeding treacle	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale	4 7	0 11	3 16	48	1 7	0.85	12.5
" " " " porter	3 17	0 11	3 6	48	1 4	0.71	12.5
Dried sugar-beet pulp (s)	5 5	0 5	5 0	66	1 6	0.80	5.2

(a) Carriage paid in 5 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

† In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of May, 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is s. 5½. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.99d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 7s. 6d.; P₂O₅, 2s. 1d.; K₂O, 3s. 8d.

FARM VALUES OF FEEDING STUFFS

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	4 19
Maize	78	7.6	4 6
Decorticated ground-nut cake	73	41.3	5 18
„ cotton cake ..	68	34.7	6 12

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.26 shillings, and per unit protein equivalent, 1.21 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1933, issue of the Ministry's JOURNAL, p. 784.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	5 2
Oats	60	7.6	4 5
Barley	71	6.2	4 17
Potatoes	18	0.8	1 4
Swedes	7	0.7	0 10
Mangolds	7	0.4	0 9
Beans	66	19.7	5 7
Good meadow hay	37	4.6	2 12
Good oat straw	20	0.9	1 6
Good clover hay	38	7.0	2 16
Vetch and oat silage	13	1.6	0 18
Barley straw	23	0.7	1 10
Wheat straw	13	0.1	0 17
Bean straw	23	1.7	1 11

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d. net.

MISCELLANEOUS NOTES

Register of Growers of Certified Narcissus Stocks.

THE MINISTRY has issued a Register of the names and addresses of growers whose stocks of narcissi have been examined in the field during the past season by the Ministry's Inspectors and certified to be true to type and reasonably free from rogues. The Register includes particulars of the certified stocks of varieties classified in accordance with the system adopted by the Royal Horticultural Society.

It should be noted that the certificates relate solely to the purity of stocks; they must not be regarded as a guarantee of freedom from disease, although no stocks were certified which, at the time of inspection, appeared to be unhealthy or lacking in vigour.

Copies of the Register may be obtained, free of cost, from the offices of the Ministry, 10, Whitehall Place, London, S.W.1.

The Agricultural Index Number

THE general index number of the prices of agricultural produce for May at 112 (the corresponding month of 1911-13 = 100) was one point above the previous month and was 10 points higher than in May, 1933. Changes in the prices of the various commodities, during the month under review, were fairly numerous, the most important being the increases in prices of fat sheep and hay and decreases in those of barley, fat pigs, eggs, butter and milk.

Monthly index numbers of prices of Agricultural Produce.
(Corresponding months of 1911-13 = 100.)

Month.	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	108
April	146	137	123	117	105	111
May	144	134	122	115	102	12
June	140	131	123	111	100	—
July	141	134	121	106	101	—
August	152	135	121	105	105	—
September	152	142	120	104	107	—
October	142	129	113	100	107	—
November	144	129	112	101	109	—
December	143	126	117	103	110	—

Grain.—Wheat, at 4s. 8d. per cwt., was 4d. dearer during May, and the index rose 2 points to 59. If allowance

MISCELLANEOUS NOTES

is made for the "deficiency payment" under the Wheat Act, 1932, the index would be increased to approximately 126, the effect of which would be to raise the general index for agricultural produce from 112 to 117. The average for barley further decreased by 5*d.* to 7*s.* 6*d.* per cwt., and the index by 5 points to 98. The index for oats also declined from 84 to 81 but, in this instance, the reduction was due to an increase which occurred in the base period, the average for May, 1934, at 6*s.* per cwt. being 1*d.* above that for April.

Live Stock.—Second quality fat cattle averaged 6*d.* per cwt. more than a month earlier, but, at 95, the index was unaltered. A rise of 1*d.* to 11½*d.* per lb. for second quality fat sheep, however, caused the index to appreciate 22 points to 150, the highest point reached since January, 1931. Fat pigs were cheaper, the index number for baconers falling 8 points to 117 and for porkers 6 points to 120. Dairy cows cheapened by 14*s.* per head and averaged approximately the same as in May, 1911-13, but store cattle, sold at about 10*s.* per head more than a month earlier, the index being 88 as against 84. A further rise of about 3*s.* 6*d.* per head occurred in the values of store sheep, which were 3 points above pre-war compared with 5 points below in April. There was little change on the month in the prices of store pigs, but the index fell 3 points to 134, owing to quotations having risen between April and May of the base period.

Dairy and Poultry Produce.—Wholesale contract prices for sales of milk during May averaged about ½*d.* per gallon less than in April and the index declined 6 points to 162, while butter realized about 1¾*d.* per lb. less and the index depreciated 6 points to 85. Eggs were reduced 3*d.* per 120 during the month under review, whereas it is customary for prices to show some recovery at this period, and, in consequence, the index showed a sharp fall of 10 points to 89. The average for dead poultry was 129 as against 119 in April; fowls were unchanged in price and index but ducks, although slightly cheaper, showed an increase of 11 points in the index..

Other Commodities.—Quotations for potatoes showed a downward tendency in May, but as a sharper decline occurred in the base period, the index moved upward by one point to 90. Further increases occurred in the values of hay, and the combined index for May was 83 compared

MISCELLANEOUS NOTES

with 80 a month earlier. As regards vegetables, cauliflowers were comparatively cheap at only 10 per cent. above pre-war, but cabbage realized 78 per cent. more. Prices for wool continued to fall, an average reduction of $\frac{7}{8}$ d. per lb. causing the index to decline 7 points to 89.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1932	1933	1934			
	May	May	Feb.	Mar.	April	May
Wheat	77	71	60	58	57	59
Barley	93	85	113	111	103	98
Oats	107	76	91	87	84	81
Fat cattle	120	97	103	99	95	95
„ sheep	107	120	112	118	128	150
Bacon pigs	103	107	129	127	125	117
Pork „	106	107	135	131	126	120
Dairy cows	118	101	101	101	103	100
Store cattle	115	99	92	86	84	88
„ sheep	89	84	91	91	95	103
„ pigs	100	112	159	143	137	134
Eggs	97	92	95	89	99	89
Poultry	136	132	118	126	119	129
Milk	137	138	161	141	168	162
Butter	108	85	86	84	91	85
Cheese	143	115	115	116	117	123
Potatoes	245	97	100	97	89	90
Hay	70	68	79	81	80	83
Wool	67	62	100	98	96	89

Revised index numbers due to Wheat Act payments.

Wheat	—	124	135	135	132	126
General Index	—	105	117	113	117	117

Licensing of Bulls in England and Wales

THE MINISTRY OF AGRICULTURE has issued for the guidance of bull owners, a booklet entitled “Guide to the Licensing of Bulls in England and Wales,” in which the procedure regarding the licensing of bulls is set out in detail. Every bull owner should secure a copy of this booklet without delay, as the Licensing of Bulls Act comes into force in England and Wales on August 1 and applications for licences for bulls that will become ten months old during August should be made during July.

Copies of the Guide may be obtained from the Ministry of

MISCELLANEOUS NOTES

Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, or 17, Eastgate, Aberystwyth, from the Secretaries of Branches of the National Farmers' Union in England and Wales, and from the Secretaries of most Pedigree Cattle Breed Societies.

Copies of the Welsh Edition of the Guide may be obtained from the Ministry of Agriculture and Fisheries, 17, Eastgate, Aberystwyth, the Welsh Black Cattle Society, and Branches of the National Farmers' Union in the Welsh-speaking parts of Wales.

Farm Institute Live Stock Judging Competition

THE eighth annual Live Stock Judging Competition, open to teams of three from Farm Institutes in England and Wales, took place on the farm of Mr. J. Timberlake, Hastoe, near Tring, Hertfordshire, on June 5. Teams of students were entered from the following counties:—

Hampshire (Sparsholt).
Hertfordshire (Oaklands).
Monmouthshire (Usk).
Northamptonshire (Moulton).
Staffordshire (Rodbaston).
Suffolk (Chadacre).
East Sussex (Plumpton).

The team from Monmouthshire proved to be the winners with a score of 264 marks out of a possible 365. The runners-up were East Sussex, and the seventh team was only 53 points behind the winning team.

The live stock to be judged had been carefully selected and, while the placing of the various animals and birds was by no means simple, no intentional traps had been set for the unwary student.

A departure from the practice of previous years was made in the object of the judging, dairy shorthorn cows being judged for dairy purposes only, while pigs were judged for bacon purposes and sheep on butchers' points only. All the competitors, among whom was one girl, showed great keenness in their inspection of the stock and considerable expert knowledge in their handling of it. Immediately after the competition the judges gave their reasons for their placing of the stock. The following judges officiated:—

Dairy Cows:	J. MacIntosh.
Horses:	T. Fowler.
Sheep:	L. J. Hawkins.
Pigs:	H. R. Davidson.
Poultry:	E. Stevens.

The party were entertained to lunch in the Lady

MISCELLANEOUS NOTES

Rothschild Village Hall, the Chair being taken by Lord Rothschild. The perpetual Challenge Cup provided by the National Farmers' Union was presented to the winning team by Mr. J. H. Wain, Vice-President of the National Farmers' Union, who, in making the presentation, said that this competition was of a most important and valuable type as it assisted to develop the quality of judgment so necessary to enable the farmer to avoid the acquisition of inferior animals which were seldom profitable.

Mr. Hawkins also spoke in high praise of the scheme so ably organized by the National Farmers' Union and expressed the view that the general level of judging was very good.

Mr. Timberlake was cordially thanked for his courtesy in allowing the competition to take place on his farm and also for the careful judgment he had shown in the selection of animals provided for the competition.

In replying to the toast of his health, Lord Rothschild said he had been most pleased to welcome the visitors and to contribute to the success of the competition. He impressed upon young farmers particularly the great importance of the faculty of observation which must accompany successful judgment in any undertaking in life.

The Provision of Village Halls

It may not be generally known amongst the villages of this country that a fund exists to assist them in the provision of village halls. The fund really consists of (a) loan out of moneys put up by the Development Commissioners, and (b) grant out of moneys found by the Carnegie United Kingdom Trustees. If a village wants a hall, an application for a loan and/or grant, from a village committee formed for the purpose, will be considered by the National Council of Social Service, 26, Bedford Square, London, W.C.1, the body in charge of the scheme. The committee must be prepared to raise a proportion of the cost, and to submit plans, and the draft trust deed must be prepared on lines approved by the National Council before work on the building is begun. The normal procedure may be summed up as follows: (1) Plans and specifications prepared by a local architect at the request of the village committee are considered by the National Council, who recommend their acceptance or amendment—a method that has the advantage of obtaining the best advice as to plans

MISCELLANEOUS NOTES

and materials, both from the point of view of local expert knowledge of what is suitable for the district, and the central expert knowledge as to new kinds of materials and latest prices; (2) sanction is given to a loan and/or grant subject to agreement that the hall will be managed by a committee on which each village organization, such as the parish council, women's institute, or British Legion, etc., is entitled to appoint a representative. The freehold site of the hall is at the same time invested in trustees for the benefit of the village.

Certain conditions as to finance are insisted on, e.g., the grant is never allowed to be more than one-sixth of the total cost, and the loan must not be more than one-third of it; the remaining half must be raised in cash by the village. For example, if a hall costs £600, the village's contribution might be £300, the grant £100, and the loan £200. All loans are free of interest and for a period of not more than five years. Adequate securities for repayment, by personal guarantees, are required in each case.

Those who know the countryside of Great Britain—the funds are available for the whole country—will realize what a useful and important instrument for improving village conditions this may be. It is a part of the general scheme that the halls so established shall not be subject to any narrow restrictions. They are to be available for use for suitable purposes by all inhabitants of the village, irrespective of religion, politics or age. No village should be without a central meeting place for all kinds of social activity. Usually, where people have built a village hall mainly out of their own contributions they take considerable pride in it and spare no pains to make it a living success. Over 250 villages have already been helped to secure a properly equipped and publicly-owned hall under this scheme.

Lands Improvement Loans

THE Lands Improvement Company have notified the Ministry that their rates of interest in respect of approved applications for loans under the Improvement of Land Acts have been reduced from $3\frac{7}{8}$ per cent. net on loans of over £500 and 4 per cent. net on loans of less than £500, to $3\frac{1}{4}$ per cent. net. This reduced rate will apply to all new loans, whether for small or large amounts, until further notice.

MISCELLANEOUS NOTES

The Agricultural Mortgage Corporation have also reduced their rates of interest from $5\frac{1}{4}$ per cent. gross to 4 per cent. gross on improvement loans and $4\frac{1}{4}$ per cent. gross for long-term loans against mortgages of agricultural land. For purposes of comparison, it should be noted that this rate is inclusive of income tax, the rate quoted by the Lands Improvement Company being a net rate after deduction of income tax.

The Agricultural Output of England and Wales, 1930-31

THIS report, which has recently been issued by H.M. Stationery Office, summarizes the results of the various special inquiries undertaken by the Ministry in connexion with the Agricultural Census of 1930-31 in England and Wales.

The inquiries show that the total value of the agricultural output in the Census year 1930-31 may be estimated to have been about £202,660,000, a reduction of £30,860,000 or 13 per cent. compared with the estimate (revised) for the previous Census year 1925. This decline is entirely due to the lower level of prices prevailing in 1930-31, since the volume of produce concerned, taken as a whole, is estimated to have increased during the period by about 4 per cent.

The main increases affecting the total volume of production occurred in dairy produce, poultry and eggs and sugar-beet. For instance, the average yield of milk per cow is estimated to have risen by 12 per cent. and the average yield of eggs per hen by 20 per cent. On the other hand, the output of pigmeat declined very materially, but the cyclical movement in pig production in this country is well known, and it so happened that production was at the cyclical maximum in 1925 and at the cyclical minimum in 1930-31. Apart from pigmeat, the main reductions took place in the corn crop group, the output of which, taken as a whole, fell by 35 per cent. The overall reduction in prices was about 17 per cent., but the rate of decrease varied very considerably among the different products concerned.

A separate chapter of the report deals with the changes since 1925 in the estimated gross rental value and selling value of agricultural land, and the estimated amount of tenants' capital employed. The estimates for 1931 all show substantial reductions compared with 1925. The gross rental value has declined by £5,650,000, or 13 per cent., the selling value of agricultural land by £170,000,000, or

MISCELLANEOUS NOTES

21 per cent., and the amount of tenants' capital by £85,000,000, or 23 per cent. These figures, and also the estimates of the value of the output, are subject to certain reservations explained in detail in the Report.

Copies of the Report may be obtained direct from H.M. Stationery Office, price 1s. net (post free 1s. 1d.), or through any bookseller.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at 7, Whitehall Place, London, S.W.1, on June 11, 1934, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders:—

Essex.—An Order fixing special minimum hourly rates of wages for employment on harvest work during the Corn Harvest of 1934. The rates apply to all time worked on harvest, and are in the case of adult male workers 10d. per hour, and in that of female workers 7d. per hour.

Lincolnshire (Kesteven and Lindsey).—An Order cancelling as from June 17, 1934, the existing minimum and overtime rates of wages, and fixing fresh rates in substitution therefor, to come into force on that date. The minimum rates for male workers of 21 years of age and over are, waggoners 37s. per week of 61 hours from October 15 to May 13, except in the week in which Christmas Day falls, when the hours are to be 52½, and 58 hours during any other period. Shepherds 35s. per week of 55 hours in summer and 56 hours in winter, except in the week in which Christmas Day falls, when the hours are to be 47½, with additional payments for lambing season. Stockmen 36s. per week of 56 hours in summer and 58 hours in winter, except in the week in which Christmas Day falls, when the hours (instead of 53 as at present) are to be 49½. Other male workers 30s. per week of 51 hours in summer and 48 hours in winter, except in the week in which Christmas Day falls, when the hours are to be 39½, with overtime in the case of all classes of male workers at 9d. per hour on weekdays and 11d. per hour on Sundays. For female workers of 17 years of age and over the minimum rate is 5½d. per hour for all time worked.

Somerset.—An Order fixing minimum and overtime rates of wages to come into force on June 24, 1934 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 30, 1935. The minimum rate for male workers of 21 years of age and over is 31s. 6d. (instead of 30s. 6d. as at present) per week of 52 hours in summer, except in the week in which August Bank Holiday falls, when the hours are to be 42½, and 50 hours in winter, except in the week in which Christmas Day and Boxing Day fall, when the hours are to be 32½, with overtime throughout the period at 9d. per hour, except for overtime employment on the Hay and Corn Harvests, when the rate is 10d. per hour. The minimum rate for female workers of 21 years of age and over is 6d. per hour for all time worked.

Yorks (West Riding).—An Order cancelling as from June 24, 1934, the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor, to come into force on that date. The minimum rates for male workers living-in are 29s. 11d. per week, or £77 15s. 8d. per annum, for foremen, 29s. per week, or £75 8s. 0d. per annum, for beastmen and shepherds, and

NOTICES OF BOOKS

27s. 1d. per week or £70 8s. 4d. per annum for waggoners. Lesser rates are fixed for 3rd and 4th lads and workers in their first and second years of employment, and all other workers living-in. These sums, which include the value of board and lodging as defined by the Committee, are in respect of 48 hours in winter and 52½ hours in summer and, in addition, not more than 12 hours per week on weekdays and 3 hours on Sundays to cover work in connection with the care and attention to stock. For waggoners and other horsemen, beastmen and shepherds not living-in, the minimum rate for the same number of hours is 38s. 6d. per week for workers of 21 years of age and over. For other male workers of 21 years of age and over the minimum rate is 33s. 9d. (instead of 32s. 9d. as at present) per week of 48 hours in winter and 52½ hours in summer. The overtime rates for male workers of 18 years of age and over are 10½d. per hour on weekdays and 1s. 0½d. per hour on Sundays. For female workers the minimum rates for workers of 18 years of age and over are 4½d. per hour for a week of 44 hours, with overtime at 5½d. per hour.

Enforcement of Minimum Rates of Wages.— During the month ending June 14, legal proceedings were taken against three employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.	Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
Bedford and Huntingdon Yorks, N.R.	Sharnbrook	£ s. d. 0 5 0	£ s. d. —	£ s. d. 6 19 11	1
	Guisborough	1 0 0	0 9 6	16 0 0	1
Merioneth and Montgomery	Llanfair	0 5 0	—	3 2 7	1
	Caerinion	£1 10 0	£0 9 6	£26 2 6	3

APPOINTMENTS

County Agricultural Education Staffs

ENGLAND

Hertfordshire:—Mr. John Murray has been appointed Instructor in Agricultural Engineering.

Bedfordshire:—Mr. J. B. Morrison, N.D.P., has been appointed Instructor in Poultry-keeping, *vice* Miss M. J. Carter, B.Sc., N.D.P. •

WALES

Carmarthenshire:—Mr. I. F. J. Morse, Manager of the County Egg-laying Trials, has been appointed County Poultry Instructor, *vice* Mr. J. B. Morrison, N.D.P.

Glamorganshire.—Mr. E. L. Harry, Instructor in Agricultural Economics, has resigned.

NOTICES OF BOOKS

The New Zealand Dairy Industry. By G. A. Duncan. Pp. xiv + 395. (Palmerston North, New Zealand: H. L. Young, Ltd., Broadway, 1933. Price 42s.)

This most interesting volume deals very fully with the development of the dairying industry in New Zealand. Attention is drawn to the

NOTICES OF BOOKS

importance of adopting standard methods, and the proposals advanced by the author in this connexion are of a practical nature; as, for example, the desirability of adopting standard forms of account to provide a sound basis for the comparison of results. The growth of the co-operative dairy industry in the Dominion is reviewed in detail, both as regards administration and finance, and in connexion with the manufacture and marketing of dairy produce. For those connected with the dairy industry, the book should have considerable value.

Manual of Plant Diseases. By Frederick D. Heald, M.S., Ph.D. Second ed. Pp. xii + 953; 259 illust. (London: McGraw Hill Publishing Co. Ltd. 1933. Price 45s.)

This manual, first published in 1926, was soon recognized as a standard textbook on its subject. That justification for this re-issue is based on the rapid output of plant-disease literature during the intervening years, rather than on the more obvious ground of demand, may be set down to the author's modesty. This second edition shows an increase of some 60 pages, but the addition being insufficient for the adequate treatment of all the new material, it was found necessary to omit the detailed information in the first edition on certain types of diseases; and this, though regrettable, was probably inevitable if the size of the work was to be kept within bounds.

The book is divided into four sections, the first (a short one) consisting of introductory matter and a discussion of disease symptoms, the second (comprising 195 pages, divided into 9 chapters) dealing with non-parasitic diseases of plants. This section is a very valuable one, devoted to matters that the ordinary mycologist is apt to neglect. The 75 pages (a single chapter) of Section III are concerned with virus and related diseases, the importance of which has been increasingly recognized in recent years. Section IV (of over 500 pages) discusses, in 16 chapters, the diseases due to parasites. The latter include bacteria, slime-fungi, fungi, seed plants and also eelworms. There is a comprehensive index of over 50 pages. The book, a product of the United States of America, will appeal primarily to students and research workers in that country; but, since most of the diseases dealt with are by no means confined to that country, and, as the principles discussed apply practically everywhere, the book should appeal to those familiar with the English language the world over. Of the numerous illustrations, a few, in the early part of the work, savour of what one associates with more ephemeral publications, and might well have been omitted, but all the rest are clear and to the point. Students will probably find the series of semi-diagrammatic representations of the more important genera of the Fungi Imperfecti particularly useful. Good lists of references to literature are furnished in connexion with most of the diseases dealt with, and will be found useful by students and research workers.

Here and there in the work a critical reviewer might find a statement or opinion with which he might not fully agree, but such minor blemishes cannot detract from the value of the volume as a whole. The book is probably the best modern presentation of the subject in the English language, and happy should be the student who, in spite of the present financial stringency, is able to purchase and study it.

Agriculture: The Science and Practice of British Farming.

By J. A. Scott Watson and J. A. More. Third ed. Pp. x + 777. (Edinburgh: Oliver & Boyd. 1933. Price 15s.)

A textbook of farming can only continue to serve its purpose if subject to reasonably frequent revision. The authors have met this proviso by a complete revision of, and addition to, what has proved a very valuable work. Those acquainted with the earlier editions will need no further recommendation; others will find a most comprehensive treatise written in a clear, concise and very readable manner.

The volume comprises four books: (i) The Soil and its Management, dealing with soil types, soil micro-organisms, manures, implements

NOTICES OF BOOKS

and cultivations; (ii) *Crops*, with their specific cultivation, manuring, harvesting, and their diseases and pests, including an excellent chapter on grassland; (iii) *Farm Live Stock* (including farm poultry), perhaps the most interesting section of all on account of the able and intelligible enunciation of the principles of breeding and nutrition; (iv) *Farm Organization and Management*, a section the value of which cannot be over-emphasized, for to-day the importance of management is realized more than ever, and those who can gain at least a portion of their experience by reading are indeed fortunate.

The book is admirably adapted for all students of agriculture. Those whose immediate object is to defeat the examiner should find in it all that they require, but they will only appreciate its practical application when using it as a work of reference on the farm. The volume is well printed and contains excellent illustrations of all classes of live stock, and of the most modern implements and machinery.

Gemüsekrankheiten. (*Diseases of Vegetables.*) By Dr. O. Appel. (Berlin, S.W.11: Paul Parey, 28 & 29 Hedemannstrasse. 1933. Price RM 5.)

This small book is No. 11 of Parey's series of pocket atlases. Despite the title, it will be found that the contents include insect pests, as well as diseases, of vegetables. There are twenty-four coloured plates illustrating the more important diseases and pests and their effects on the host plants. Some of the plates are concerned with a single pest or disease, but several depict two, and some three, diseases or pests. Opposite each coloured plate is a succinct account of the matters illustrated, including brief statements as to control measures. In those instances in which official leaflets are published, at a cheap rate, concerning particular diseases or pests, references are given, so that fuller accounts can be obtained if desired. Most of the diseases and pests dealt with occur in the British Isles, and to anyone familiar with the German language here the booklet will serve as a handy guide. The coloured drawings by the well-known artist A. Dressel are bold, yet sufficiently clear in detail to enable the various diseases and pests to be recognized without great difficulty. Cabbage and its allies, spinach, carrot, celery, kidney bean, pea, lettuce, cucumber, tomato, asparagus and onion are the hosts included. Separate booklets in this Series (Nos. 1, 2 and 7) have already been devoted to potatoes.

Index Veterinarius. Vol. I, No. 1. Pp. 304. (Weybridge: Imperial Bureau of Animal Health. 1933. Annual Subscription [four quarterly issues] £4.)

This work is designed to form a complete index to publications concerning veterinary research, hygiene, administration and education. The present issue covers the indexing done at the Imperial Bureau during the first quarter of 1933, and each subsequent number will deal with the work of the corresponding previous quarter. All the information is readily accessible, a typical reference consisting of the author's name, year of publication, full title in language of origin, with English translation of the title in languages other than French or German, publication of origin with relevant details, volume number, pages, etc. The *Index* has been well produced by mimeograph, and strongly bound in a stiff printed wrapper.

The Wright Encyclopædia of Gardening. By P. Wright. Pp. xvii + 624, and 350 Illustrations. (London: J. M. Dent and Sons, Ltd. 1933. Price 15s.)

The amateur gardener often prefers to obtain the information he requires in brief "tabloid" form, and for him an encyclopædia as a reference book is well suited. A great deal of information on all branches of horticulture has been included in the "Wright Encyclopædia," the notes on propagation and the glossary being particularly good features. An alphabetically arranged catalogue of plants is very informative, and this is followed by a summary of garden science,

NOTICES OF BOOKS

which might be improved in subsequent editions by giving bibliographical references. Numerous illustrations are included, although these are of uneven merit.

Every author of an encyclopædia has the difficult task of giving the fullest information in the fewest possible words; in this book the author cannot be whole-heartedly commended for excluding unessential matter in favour of practical details.

A Short Course in Elementary Meteorology. By W. H. Pick, B.Sc., F.C.P., F.Inst.P. Pp. 143. (London: His Majesty's Stationery Office, 1933. Price 2s. 6d.)

Weather, states the author in his introductory chapter, is an important matter to most men, no matter what their occupation may be. He couples the agriculturist with the mariner as those who "find it of supreme importance," and, indeed, meteorological conditions can, and do, exert great influence on agriculture. This book is a completely revised edition of a work originally issued in 1921. As the name implies, it sets out the elements of the science of meteorology in, for the most part, simple non-technical language. Although not addressed specifically to the agriculturist, there is much in the book that will be of both interest and practical use.

L'élevage Moderne et L'industrie du Lapin (*Modern Breeding and the Rabbit Industry*). By L. Bréchemin. Pp. 195 and 42 Figs. (Paris: Librairie Agricole de la Maison Rustique, 26 rue Jacob, VIe. 1933. Price 9.50 fr.)

This manual embodies the results of the author's forty years' experience as a practical rabbit breeder. A preliminary chapter traces the origin of the domestic rabbit, and this is followed by chapters on housing, hygiene, reproduction, feeding, breeds and varieties, and diseases. Of special interest is a review of the business aspects of the subject, giving advice on methods of preparing and marketing various products and by-products. Rabbit breeders with a knowledge of French will find much useful information in this book.

Untersuchungen Über das Kalkbedürfnis der Böden Durch

Laboratoriumsmethoden und Düngungsversuche. (*Investigations into the Lime Requirement of Soils by Laboratory Methods and Manurial Experiments*). Second supplement to *Zeitschrift für Pflanzenernährung, Düngung und Bodenkunde*. Edited by O. Lemmermann and L. Fresenius. Pp. 463. (Berlin W.10: Verlag Chemie, G.m.b.H., Corneliusstrasse 3. Price RM 20.)

Many of the empirical methods for measuring soil acidity and for estimating the so-called "lime requirements" of soils originated in Germany, and a large proportion of the Continental publications on soil science and agricultural chemistry during the last two decades has been devoted to discussions of their relative merits. In the three years, 1930 to 1932, sixteen German experiment stations and research institutions examined nine of the current methods on a few representative acid soils at each centre, amounting to over sixty in all. The laboratory tests were accompanied by a large number of pot culture experiments and a number of field trials on the effects of different amounts of lime. The present volume consists of sixteen independent and detailed reports, divided, in most instances, into separate accounts for each of the three years. From such a mass of diverse material, it is not feasible, as the editor remarks, to draw any general conclusions beyond the one that the whole subject of liming is extraordinarily complicated.

On most of the light mineral soils, quite small amounts of lime, corresponding with the so-called "exchange acidity," proved adequate for the less sensitive crops, whilst larger amounts (approximately the "hydrolytic acidity") were required for the more sensitive crops. On heavier soils, the higher rates were required for both sorts of crops. The optimal dressing of lime depended on the fertilizers used;

NOTICES OF BOOKS

sometimes ammonium sulphate increased and sodium nitrate decreased the field lime requirement to an appreciable extent.

With soil acidity and liming, as with so many other soil questions, the most important and, at the same time, the weakest link in the chain connecting the farmer, the agricultural organizer, the advisory chemist and the research worker, is the field experiment. Crude empirical methods of soil analysis may be replaced with advantage by sounder ones made possible by recent work on the physical chemistry of soils, but no method can be used successfully in practice until it has been standardized. This may be done either by a series of sound field experiments under representative conditions, or by the much more expensive and inefficient method of waiting until sufficient experience accumulates from its employment in advisory work. This German co-operative effort to forge a link between the theory of soil acidity and the practice of liming may seem somewhat tedious and inconclusive, but it must be admitted that no adequate similar attempt has yet been made in this country. We have, however, developed both the laboratory work and the art of field experimentation to levels that should provide reliable and valuable results as soon as the necessary field trials can be organized and financed.

Plant Parasitic Nematodes and the Diseases they Cause. By T. Goodey, D.Sc. Introd. by R. T. Leiper, M.D., D.Sc., F.R.S. Pp. xx + 306 and 136 Figs. (London: Methuen & Co. Ltd. 1933. Price 21s.)

Although eelworms are responsible for, or associated with, some of the most important plant diseases, no general account of the species concerned has hitherto been published, and information about them is scattered over a wide range of scientific and technical periodicals. Dr. Goodey's book, therefore, will be of great value to entomologists and others whose work is connected with the problems of plant pathology.

After an introductory chapter on structure, methods of mounting and examination, and the classification of eelworms, there follow six chapters dealing with the parasitic species. These are described in detail, full lists of host plants are given, and the methods adopted for the control of the worms on hosts of economic importance are outlined. Non-parasitic eelworms are described in a separate chapter, and the distinctions between these and the parasitic forms are emphasized. The final chapter deals with the interesting problem of "biological races," which is such a pronounced feature of the group.

Lists of references are given at the end of each chapter, and an adequate index is provided. In a future edition a glossary of technical terms would be advantageous, and it seems a pity that the generic characters could not have been arranged in the form of a key. The measurement formulæ again, used in describing some of the worms, are rather alarming to a non-specialist—to one who was not working continuously on the group, the formula on p. 11, for instance, would be incomprehensible. The changes in nomenclature rendered necessary by the law of priority, though inevitable, are to be regretted, and in certain instances may cause confusion. For instance, the Root-Knot eelworm, formerly known as *Heterodera radicicola* has become *H. marioni*, while *Tylenchus hordei*, which attacks the roots of cereals and grasses is known as *Anguillulina radicicola*.

These, however, are minor points, and Dr. Goodey may be congratulated on producing a really valuable textbook on the subject.

The Foundations of Agricultural Economics. By J. A. Venn, Litt.D. Second ed. Pp. xx + 600; 20 Figs., 38 Maps and Diagrams. (London: Cambridge University Press, 1933. Price 25s.)

It is a matter for congratulation, not only to Dr. Venn but to the agricultural public, that a second edition of this work should have

NOTICES OF BOOKS

been called for. The book still retains its original form. Its approach to the subject is more that of the historian than of the economist, but its size has been greatly increased, additions having been made to most of the original chapters, while seven new chapters are included, this new material adding greatly to the value of the work.

In its new form, the book constitutes a broad survey of the major economic questions relating to British agriculture, while touching, by way of comparison rather than of exposition, upon certain corresponding questions in regard to foreign countries. In addition to the information relating to the near East, used in this comparison in the previous edition, the results of a further journey to the far East have provided Dr. Venn with a wider range of comparative data, of which he has made excellent use.

The contents of the first edition were described in a notice which appeared in this JOURNAL in November, 1923, and the new material which is added here takes the form of an introductory chapter dealing with the interrelationship of economic theory and agricultural practice, in addition to which the following sections have been recast and expanded:—Modern land tenure; Tithe; Land Tax, rates and taxes; Markets and Marketing; Agricultural Co-operation; Wheat Supply. The first part is now completed by a chapter on crop estimating and forecasting and a new second part of three chapters, under the general heading of "An economic history of British Agriculture during and after the Great War," has been added. Here again, the treatment is from the historical rather than the economic standpoint, but it is pleasant to find one writer to whom we may be indebted for adopting this method. Dr. Venn's book shows clearly that the present has its roots in the past, and that adequate legislation for modern problems is to some extent dependent upon a complete conspectus of the historical circumstances out of which these modern problems have developed. The various factors that have gone to build up the modern structure of landholding and farming in this country are examined, and readers will begin to realize that a simple solution for all these complexities is outside the realm of possibility; and that, perhaps, the measures at present current, both in the modification of landholding, introduced with the abolition of copyhold by the Act of 1926, and in the efforts now being made towards adapting British farming to the changed and changing economic movement, are steps in the right direction.

Dr. Venn's book is admirably written, in spite of the inclusion in this new edition of a good deal of rather difficult material, which, however, unquestionably increases its utility.

Soil Management for Greenkeepers. By M. H. Cubbon, Ph.D., and M. J. Markuson, B.S. Pp. 152, and 9 Figs. (Amherst, Massachusetts State College. 1933.)

This volume is divided into two distinct sections, of which the first, by Dr. Cubbon, bears the title of the book, while the other, dealing with golf course drainage, is by his co-author. It deals not only with the general make-up of soils but with such subjects as measurements of acidity, plant nutrients, effects of organic matter on soils, physical condition, nitrogen cycle in soil, fertilizers (their values and uses), watering greens, weedicides, and a host of other subjects of equal importance in the maintenance of golfing or sports turf. Nevertheless, the book cannot be whole-heartedly recommended to greenkeepers and groundsmen responsible for turf upkeep in this country. Two reasons may be given for this. First, being written solely for Americans, many of the conditions or materials dealt with are unfamiliar in this country, and moreover the prices quoted do not apply. Secondly, the greenkeeper in this country is essentially a practical man, at the best of times ill-disposed towards the printed word, and the appearance of so many formulæ, tables, glossaries,

NOTICES OF BOOKS

prices, and general figures, is not likely to encourage him to read the book.

There are certain obvious omissions. Thus, while space is devoted to general fertilizers, many of the common organic materials used on turf both here and in America are not mentioned. Again, little or no attention is given to the essential process of top-dressing fine turf, to the cultivation of a seed bed preparatory to sowing, or to the value of sulphate of ammonia as a weedicide. The section dealing with golf course drainage forms a valuable contribution, although it is probable that course constructors or contractors would find this part of more service than the greenkeeper.

In spite of these criticisms, the book forms a useful contribution to greenkeeping as a whole, and a place could be found for it in the office of golf secretary or course manager, who will be better able to apply the information it contains to our conditions of climate, soil, or management.

The British Goat Society's Year Book, 1934. Pp. 180, and 72 figs. (Compiled and issued by the Secretary, H. E. Jeffery, Roydon Road, Diss, Norfolk. Price 1s. 6d.)

The 1934 issue of this annual contains many features of interest and practical utility to those who have the care and management of goats. Naturally, milk production is the subject of many contributions, but other aspects of goat-keeping, such as genetics, nutrition, tethering, diseases and general research receive attention. There are three articles on housing, each illustrated by diagrams and plans; notes on goats in Ulster and Spain; an article by the Secretary dealing with the important subject of "Winter Milk"; and useful data concerning the activities of the Society and its affiliated organizations. A comparative statement of the annual yields of goats officially recorded under the Ministry's scheme shows that the maximum yield has increased from 4,795 lb. in 1931-2 to 4,935 lb. 4 oz. during the year ended October 1 last. The British breed still holds the record with a yield of 5,050 lb. 15 oz. during the year 1929-30.

The National Farmers' Union Year Book, 1934. Pp. 512. (London: National Farmers' Union, 45, Bedford Square, London, W.C.1. Price 5s.)

Evidence of the wide range of interest covered by this annual is afforded by the index of 26 pages, which includes among its references such subjects as agricultural education, research, advisory facilities, income tax, tithe and land tax, railway rates and charges, fertilizers and feeding stuffs. A chapter devoted to "The Marketing Schemes of 1933" contains an interesting account of activities in connexion with the pigs, milk and potato schemes. The Marketing Acts of the year are summarized, as well as other legislation affecting agriculture, and fresh notes have been added to the information for tenants and owner-occupiers. A statistical section provides an abstract of figures relating to the industry, and there is a useful appendix dealing with the quantitative regulation of agricultural imports since the publication of the previous issue.

The Owner-Gardener. By Sir Edward Anson, Bart. Pp xvii + 276. (London: John Murray. 1934. Price 7s. 6d.)

"Careful planning" should be the motto of every gardener, and it is the keynote of Sir Edward Anson's new book for the uninitiated amateur. All over the country are springing up new houses with garden plots, and the new inhabitants have rushed into the making of a garden without any plan, only to be discouraged by the results. A study of this excellent book should do much to set the beginner on the right lines in planning both the kitchen and the flower garden. A particularly good chapter is devoted to tools and their use, and the principles and practices of manuring are clearly explained. Special sections are devoted to bulbs, irises, roses and sweet peas, in addition

NOTICES OF BOOKS

to more general ones on shrubs and climbers, the herbaceous border and rock gardens. Evidently writing from much personal experience, the author has a happy knack of discussing just those subjects that most interest or puzzle the owner-gardener. The book is as carefully planned and proportioned as the model garden, and, very wisely, the author has not given a long list of varieties, but recommends the gardener to choose his own by visiting nurseries and flower shows. Although many people will not grudge spending 7s. 6d. for all this excellent subject matter, it might seem that a book of this size, without illustrations, could have been issued at a somewhat lower price.

A Manual of the Timbers of the World. By A. L. Howard. Second ed. Pp. xxiii + 672 and 91 figs. (London: Macmillan & Co., Ltd. 1934. Price 36s.)

Such a book as this is invaluable as a work of reference to anyone who, in the course of his business, may have occasion to use timber, or control its use, either for structural, decorative, or other purposes. Apart from a brief preface to the revised edition, and a somewhat longer general survey, which formed the introduction to the original publication in 1920, the volume consists wholly of alphabetically-arranged descriptions of the varieties, sources and characteristics of the many species commonly or occasionally used as timber trees. Though chiefly of use for reference, however, these entries are more than a mere catalogue; and, individually, they often make quite good reading, being interspersed with allusions from great literature of the past to the particular timber described. The information in each instance seems singularly complete and helpful; tested by reference, none of the less-known British timbers appear to have been omitted, and timbers of foreign or Dominion origin are discussed with an impartiality that is apt to be lacking in information derived from interested sources. One specially useful piece of information, given in most instances, is the indication whether ample or limited wealth of supplies are likely to be available.

Two items from the introductory sermon deserve to be given prominence: first, that "it would be no exaggeration to say that very large quantities of timber grown throughout the United Kingdom, at present used for fuel, might be utilized to general advantage"; and secondly: "We cannot wish to see the number of our woodland areas decrease As far as may be reconciled with economic principles, the denuded areas should be replanted, and fresh trees introduced."

Spray Calendar. (Issued by the East Malling Research Station. 1934. Price 5s.) East Malling, Kent.

The spray calendars that have proved so popular on the American continent have not, up to the present, been widely used in Great Britain, possibly because the different spray treatments required with the more important fruit crops have not been sufficiently standardized to admit of a description in calendar form. With the progress of research, however, this difficulty is becoming less, and it is now possible to indicate for most fruit crops a series of spray applications that, if intelligently carried out, will result in the elimination of such pests and diseases as can be controlled by this method of treatment. In this connexion, much interest attaches to the issue by the East Malling Research Station, on the twenty-first anniversary of its foundation, of a special spray calendar. The calendar, which is planned on the pattern of one in use by the Dutch Horticultural Laboratory at Wageningen, aims at giving the maximum possible information in a minimum of space, and in this it is conspicuously successful. No fewer than twelve fruit crops are dealt with, and both the nature of the spray treatments and the months or weeks when they should be used are shown for the twelve calendar months.

The calendar is issued primarily to Associate Members of the Kent Incorporated Society for Promoting Experiments in Horticulture, but

NOTICES OF BOOKS

it is understood that copies are also available, price 5s. each, for those who are not subscribers to the Station. The calendar can be thoroughly recommended both to the commercial fruitgrower and to the amateur, who is often equally interested in controlling the many pests and diseases that damage his fruit.

Animal Breeding in the British Empire. By F. Fraser Darling, Ph.D., N.D.A., N.D.D. Imperial Bureau of Animal Genetics. Pp. 47. (Edinburgh: Oliver & Boyd. 1934. Price 1s.)

This is a concise study of a wide subject, and its character makes it difficult to do more than indicate its contents. The author surveys the business of animal breeding in all parts of the Empire, and deals with all classes of stock from horses to camels and goats. The last two are, of course, of less importance in world trade than the meat, hide and wood producers, but they are of immediate consequence to the peoples who breed and utilize them.

The author rightly points out that the whole subject falls into two main categories according to climate, and that, broadly, the line of demarcation is between the temperate and tropical zones, in which both the primary problems involved and the purposes for which animals are required, are often very different. For example, where beef production is the end in view, the breeder desires an animal of different conformation from that required in places where the ox is wanted principally for draught purposes. Similarly, sheep for meat and for wool present different problems.

These and kindred subjects are clearly discussed, and this survey supplies a ready conspectus of the variety of work that is being carried out to provide answers to the many questions arising in so widespread an area as the Empire. The author deals with the major branches of the industry, at home and overseas, that provide large scale supplies for disposal through the channels of world trade; but he does not neglect to supply information about the no less important and interesting questions presented for solution by the animal breeding industries of those areas of the tropical Colonies where production mainly serves local requirements.

Rural Britain To-Day and To-Morrow. By J. A. Scott Watson. Pp. xiii + 161, and 12 figs. (Edinburgh: Oliver & Boyd. 1934. Price 5s.)

The contents of this book will need little introduction to agriculturists, because the substance of it has already been given in the form of a series of popular wireless talks, introduced by the Minister of Agriculture. The Minister's address appeared in this JOURNAL for November last, p. 703, and Professor Scott Watson has contributed, since February last, a monthly article under the title "Some Impressions of British Farming." It is certain, however, that many people will desire to possess this survey of modern farming in a more permanent and complete form than a series of articles or than their memories of broadcast lectures can provide.

It is not possible, of course, in a six weeks' tour, even with the aid of a modern motor car, to conduct such a detailed survey as earlier, more lengthy and slowly progressing observers have done, but Professor Scott Watson has provided a concise survey covering the more salient points of British farming to-day, and has presented the whole in an attractive form. The book, therefore, can be warmly recommended as a reliable and stimulating bird's-eye view of rural Britain.

Bibby's Book on Milk. Section 1. Second ed. Pp. 55, and 24 figs. (Liverpool: J. Bibby & Sons, Ltd. 1933. Price 7s. 6d.)

This is an interesting booklet, in which some of the difficulties that have had to be faced, both by producers and distributors, are considered in a simple and straightforward manner. A section deals with many of the dairyman's difficulties in maintaining quality, and gives

NOTICES OF BOOKS

a number of practical ways of avoiding trouble. The value of analytical work (whether carried out as a basis for legal action or not) depends very largely on the method of taking samples. This subject is fully discussed and should prove helpful to those whose duties require them to draw samples for analysis.

The Effect of Butter and Cheese Supplies on "Surplus" Milk Prices. By R. L. Cohen and K. A. H. Murray. Pp. 19. (Oxford: Agricultural Economic Research Institute. 1933. Price 1s.)

This is an interesting study of the possibility of obtaining higher returns for "surplus milk," and the methods that might be adopted to attain this result. The pamphlet makes it clear that success can only be achieved by the restriction of imports of butter and cheese, and that the restrictions would have to apply to all importing countries, including the Dominions. It will be noted that special attention has been paid to the effect that different conditions of restrictions of supply might have in New Zealand.

As a statistical study, this is an admirable pamphlet of its particular type, and if the writers' assumptions on which it is based are accepted, the reader will have no difficulty in agreeing with the conclusions reached. The validity of some of the original assumptions may be questioned, however, and, in this light, the findings would be subject to some modification.

The Hard Winter Wheat Pools. By J. G. Knapp. Pp. ix + 180. (Chicago: University Press. 1933. Price \$1.50.)

This is a thoughtful study and a clear exposition of the experimental application of the pooling principle to wheat marketing. Although based on the detailed experience of the hard winter wheat pools of the United States, the writer takes a wide view of his subject and discusses also the possibilities of planned production and the international regulation of wheat marketing.

The historical survey shows how the pools departed from the original crude theory of orderly marketing, how the water-tight five-year contract gave way to a more liberal contract allowing members to withdraw on comparatively short notice, and how by force of competitive merchant services, seasonal pooling in large measure has given way to optional pooling, so that in effect members may sell their wheat for cash on a daily price basis.

The pooling movement as it exists to-day has been largely merged into the expanding Farmers' National Grain Corporation, which controls elevators and serves individual farmers in much the same way as a large wholesale grain business. The author feels that there is a danger that this large-scale Federal experiment may strangle worthy experiments in wheat pooling in the various States. He admits that "the pooling movement in the United States is to-day at a low ebb," but asks, "Will not regional organizations of the pool type come back into favour and farmers' elevators and co-operative commission firms lose their position as key units in a plan designed to develop a unified growers' co-operative marketing system?"

Although the author is a strong advocate of co-operation between grower and grower, and suggests the possibility of international co-operation, the cleavage between grower and merchanting interests in the States is apparently still so deep that he is not yet prepared to accept the challenge of the future—which demands, as the price of progress, an immediate extension of the principle of co-operation so as to embrace co-operation between producers and distributors for their mutual benefit. If the wheat pools of the United States are on their death bed they could have no better or worthier obituary than this book.

ADDITIONS TO THE LIBRARY

Agriculture—General and Miscellaneous

- Oxford, Agricultural Economics Research Institute.*—The Agricultural Register, 1933-34. Being a Record of Legislation, Organisation, Supplies and Prices. (vii + 229 pp.) Oxford: Agricultural Economics Research Institute, 1934, 3s. 6d.
- Watson, J. A. S.*—Rural Britain To-day and To-morrow. (xxiii + 161 pp. + 12 pl.) London and Edinburgh: Oliver & Boyd, 1934, 5s.
- Hennell, T.*—Change in the Farm. (x + 201 pp.) Cambridge, at the University Press, 1934, 10s. 6d.
- Woodward, W. A.*—The Countryman's Jewel. Days in the Life of a Sixteenth Century Squire. (Edited by Marcus Woodward.) (xvii + 310 pp.) London: Chapman & Hall, 1934, 15s.
- Clark, H. A.*—Country Mixture. (288 pp.) London: Philip Allan, 1934, 7s. 6d.
- Keldorfer, H.*—Die Landwirtschaft von England und Wales. Versuch einer geographischen Darstellung ihrer Landschaftlichen Verschiedenheiten. (x + 196 pp.) Freiburg i Br. und Heidelberg: Geographischer Institute der Universitäten, 1933, R.M. 5.50.
- Stone, A. A.*—Farm Machinery. (2nd edition.) (xii + 466 pp.) New York: Wiley; London: Chapman & Hall, 1934, 18s. 6d.
- Kuchler, L. F.*—Silo-Sparwirtschaft. (248 pp.) München: Knorr & Hirth, 1934, R.M. 4.20.
- Wilts. County Council.*—Agricultural Education Sub-Committee. Advisory Report on Arable Land, Sheep Husbandry, Poultry Keeping. (96 pp.) Trowbridge, 1934.
- Seale-Hayne Agricultural College.*—Pamphlet No. 41:—Labour Requirements of Crops and Stock in the South-West, by W. H. Long and N. F. McCann. (71 pp.) Newton Abbot, 1934.
- Scotland Department of Agriculture.*—The Agricultural Output of Scotland, 1930. Report on Certain Statistical Inquiries made in connexion with the Census of Production relating to the Output of Agricultural Produce. [Cmd. 4496.] (79 pp.) Edinburgh: H.M. Stationery Office, 1934, 1s. 3d.
- Scottish National Development Council.*—Economic Series No. 7:—Report of the Committee on Agriculture in Scotland. (42 pp.) Glasgow, 1934, 6d.
- Scottish National Development Council.*—Economic Series No. 11:—Report of Committee on Rural Industries in Scotland. (24 pp.) Glasgow, 1934, 6d.
- Canada.*—Proceedings of the World's Grain Exhibition and Conference, Regina, Canada, July 24-August 5, 1933. Vol. I. (479 pp.) 1934.
- United States Department of Agriculture.*—Agricultural Adjustment. A Report of Administration of the Agricultural Adjustment Act, May, 1933, to February, 1934. (xi + 393 pp.) Washington, 1934, 25 cents.
- United States Department of Agriculture.*—Miscellaneous Publication No. 171:—The Crop and Live Stock Reporting Service of the United States. (104 pp.) Washington, 1933.
- International Labour Office and International Institute of Agriculture.*—Studies and Reports (of the I.L.O.), Series K (Agric.), No. 12:—Studies on Movements of Agricultural Population. I. The Rural Exodus in Germany. (137 pp.) London: P. S. King & Son, 1933, 3s. 6d.

ADDITIONS TO THE LIBRARY

- Ross-Mackenzie, J.*—Brewing and Malting. (3rd edition.) (xvi + 182 pp. + 1 pl.) London: Sir I. Pitman & Sons, 1934, 10s. 6d.
- Robertson, C. J.*—World Sugar Production and Consumption. An Economic-Geographical Survey. (vi + 142 pp.) London: Bale, Sons & Danielsson, 1934, 5s.
- Hind, J. R.*—Woollen and Worsted Raw Materials, Covering the Syllabus of the City and Guilds of London Examinations in these subjects. (x + 214 pp.) London: Benn, 1934, 8s. 6d.
- Macassey, L., and Saleeby, C. W.* (Edit.).—Spahlinger contra Tuberculosis. 1908-1934. An International Tribute. (xvi + 271 pp.) London: Bale, Sons & Danielsson, 1934, 12s. 6d.
- Dunlop, W. R.*—Analytical Judgment Accounts. (52 pp.) Published by the Author at 57, Gordon Square, W.C.1, 1933, 3s. 6d.
- Wallace, D.* (Mrs. R. H. Rash).—The Tithe War. (176 pp.) London: Gollancz, 1934, 3s. 6d.
- Germany, Statistischen Reichsamts.*—Deutscher Landwirtschafts-atlas. (31 pp. + 104 karten.) Berlin, 1934.
- Russia, Académie Lénine des Sciences Agricoles de l'U.R.S.S.*—Institut de production végétale. La Turquie agricole (Partie Asiatique-Anatolie). *Prof. P. Zhukovsky.* (xxvii + 908 pp. + plates and map.) (Written in Russian, Summary in French.) Moscow and Leningrad, 1933.
- Clévenot, E.*—La production des primeurs dans l'Afrique du Nord et leur commerce d'exportation. Etude géographique et économique. (113 pp.) Paris: Société d'Éditions Géographiques Maritimes et Coloniales, 1933.

Agricultural Economics

- Timoshenko, V. P.*—World Agriculture and the Depression. [Michigan Business Studies, Vol. v, No. 5.] (123 pp.) Michigan: School of Business Administration, 1933, \$1.
- United States Department of Agriculture.*—Economic Bases for the Agricultural Adjustment Act. (67 pp.) Washington, 1933.
- Dowell, A. A. and Jesness, O. B.*—The American Farmer and the Export Market. (269 pp.) Minneapolis: University of Minnesota Press; London: Humphrey Milford, 1934, 9s.
- Clay, C. M.*—The Mainstay of American Individualism. A Survey of the Farm Question. (xiii + 269 pp.) New York and London: Macmillan, 1934, 10s. 6d.
- Union of South Africa.*—Report of the Commission to Inquire into Co-operation and Agricultural Credit. (207 pp.) Cape Town, 1934, 4s.
- United States Department of Agriculture.*—Bureau of Agric. Economics. Agric. Econ. Bibliography No. 41:—The Domestic Allotment Plans for the Relief of Agriculture. Selected References. (48 pp. mimeo.) Washington, 1933.
- United States Department of Agriculture.*—Bureau of Agric. Economics. Agric. Econ. Bibliography No. 42:—Measures Taken in Foreign Countries to Relieve Agricultural Indebtedness. (57 pp. mimeo.) Washington, 1933.
- United States Department of Agriculture.*—Bureau of Agric. Economics. Agric. Econ. Bibliography No. 50:—Agricultural Relief. A Selected-Annotated Bibliography. (382 pp. mimeo.) Washington, 1933.
- United States Department of Agriculture.*—Bureau of Agric. Economics. Agric. Econ. Bibliography No. 45:—State Measures for the Relief of Agricultural Indebtedness in the United States, 1932 and 1933. (64 pp. mimeo.) Washington, 1933.
- United States Department of Commerce.*—15th Census of the United States, 1930. Census of Distribution. Agricultural

ADDITIONS TO THE LIBRARY

Commodity Series. Co-operatives as a Factor in the Distribution of Agricultural Commodities. (65 pp.) Washington, 1934, 10 cents.

Agricultural Education

Board of Education.—Educational Pamphlets No. 99:—Education and the Countryside. (106 pp.) London: H.M. Stationery Office, 1934, 1s. 6d.

Kent Education Committee.—Education in Kent during the five years 1928-1933. (iv + 225 pp. + 17 pl.) Maidstone, 1934.

Soils

Wright, C. H.—Soil Analysis. A Handbook of Physical and Chemical Methods. (viii + 236 pp.) London: T. Murby & Co., 1934, 12s. 6d.

Imperial Bureau of Soil Science.—Technical Communication No. 28:—Soil Erosion, by *T. Eden*. (30 pp.) Harpenden, 1933, 2s.

Fussell, G. E.—Soil Classification in the 17th and 18th Centuries. (Reprinted from "Pedology," 1933, No. 5, pp. 409-419.)

Lemmermann, O.—Methoden für die Untersuchung des Bodens. Teil II. (122 pp.) Berlin: Verlag Chemie, 1934, R.M. 7.50.

Field Crops

Rothamsted Experimental Station, Harpenden.—Problems of Potato Growing, being the Report of a Conference held at Rothamsted on February 20, 1934, under the chairmanship of *Capt. J. Mollett*, with contributions by *Sir E. J. Russell, G. H. Pethybridge*, and others. (48 pp.) Harpenden, 1934, 2s. (Rothamsted Conference xvi.)

Imperial Bureau of Plant Genetics: Herbage Plants.—Bulletin No. 14:—Grassland Research in Australia: Future Programme and Contributions on Pasture Technique. (ix + 43 pp. + 1 pl.) Aberystwyth, 1934, 3s.

Zade, A.—Pflanzenbaulehre für Landwirte. (xi + 533 pp.) Berlin: Paul Parey, 1933. R.M. 24.80.

Horticulture

Dakers, J. S.—The Garden Frame. (viii + 184 pp. + 8 pl.) London: Cassell, 1934, 2s. 6d.

Dakers, J. S.—Tomatoes and Cucumbers. (156 pp.) London: Cassell, 1934, 1s. 6d.

Catchpole, N.—Simple Pruning. (x + 133 pp. + 8 pl.) (2nd edition.) London: W. H. & L. Collingridge. [1934.] 2s. 6d.

Dunkin, H.—The Pruning of Hardy Fruit Trees. (xiii + 76 pp.) London: J. M. Dent & Sons, 1934, 5s.

Anson, Sir E. R.—The Owner Gardener. (xvii + 276 pp.) London: Murray, 1934, 7s. 6d.

Plant Pests, Etc.

Glasgow, West of Scotland Agricultural College.—Research Bulletin No. 3:—Helminthosporium Disease of Oats. (74 pp. + 23 pl.) Glasgow, 1933.

Imperial Bureau of Fruit Production.—Technical Communication No. 5:—The Degeneration of the Strawberry: I, Pomological Aspect, *D. Akenhead*; II, Virus, *R. V. Harris*; III, Root Rot, *G. H. Berkeley*; IV, Insects and Other Animals, *A. M. Massee*. (28 pp.) East Malling, 1934, 2s.

Day, W. R. and Peace, T. R.—The Experimental Production and the Diagnosis of Frost Injury on Forest Trees. (Oxford Forestry Memoirs No. 16, 1934.) (60 pp. + 10 pl.) Oxford, at the Clarendon Press, 1934, 6s.

Kofoed, C. A., and others.—Termites and Termite Control. (Report to the Termite Investigations Committee.) (xxv + 734 pp.) Berkeley, at the University of California Press, and Cambridge, at the University Press, 1934, 22s. 6d.

ADDITIONS TO THE LIBRARY

- Long, H. C.*—Suppression of Weeds by Fertilizers and Chemicals. (x + 57 pp. + 10 pl.) Published by the Author at "The Birkins," Hook, Surbiton, 1934, 2s. 2d., post free.
- United States Department of Agriculture.*—Miscellaneous Publication No. 176:—Bibliography of Chloropicrin, 1848-1932. (88 pp.) Washington, 1934.

Live Stock

- Irish Free State.*—Pig Industries Tribunal. Report on Pig Production in Saorstát Éireann and the Industries and Trades dealing with Live Pigs, Pig Meat, whether Fresh or Cured, and other Pig Products. [P.1170.] (166 pp.) Dublin: Stationery Office, 1933, 2s.
- Imperial Bureau of Animal Nutrition.*—Technical Communication No. 4:—Problems of Animal Nutrition and Animal Husbandry in Northern Nigeria, by A. W. Anderson. (52 pp.) Aberdeen, 1933, 1s.

Animal Breeding

- Imperial Bureau of Animal Genetics.*—Animal Breeding in the British Empire, by F. Fraser Darling. (47 pp.) Edinburgh and London: Oliver & Boyd, 1934, 1s.
- France, La Société Nationale d'Encouragement à l'Agriculture.*—Congrès de l'élevage de 1932. Paris, 5, 6 & 7 Décembre 1932. Compte-rendu. (661 pp.) Paris.
- Imperial Bureau of Animal Genetics.*—Supplement to "Animal Breeding Abstracts." Vol. I:—A Bibliography of the Works of James Cossar Ewart, compiled by J. H. Ashworth and F. Fraser Darling. (11 pp.) Edinburgh and London: Oliver & Boyd, 1934, 6d.

Dairying

- International Institute of Agriculture.*—International Directory of Dairying Institutions. (viii + 437 pp.) Rome, 1934, 20 liras.
- Duncan, G. A.*—The New Zealand Dairy Industry. (xiv + 395 pp.) Palmerston North, N.Z.: H. L. Young; London: Whitcomb & Tombs, 1933, £2 2s. 0d.
- Beau, M., and Bourgain, Ch.*—L'industrie fromagère. I. La science fromagère. (218 pp.) II. La technique fromagère. (216 pp.) Paris: J. B. Baillière et Fils, 1926 & 1927, 24 fr.
- Love, R. M.*—The Milk Problem. A Critical Review and a New Solution. (51 pp.) Published by the Author at Downash Farm, Flimwell, Sussex, 1934, 6d.

Poultry Keeping

- Bowers, F.*—Plain Poultry Science. (ix + 118 pp. + 17 pl.) London: Purpose Publishing Co., 1934, 3s. 6d..
- Institute of American Poultry Industries.*—Eggs. (General Editor: P. Mandeville.) Book I: Whence Come our Eggs and Poultry? Book II: The Best of Food—Eggs and Poultry. (631 pp.) Chicago: Progress Publications, 1933.
- D'Arches, M., et Debroucker, L.*—L'élevage des poulets en chambre. (168 pp.) Paris: Librairie Agricole de la Maison Rustique, 1934, 10 fr.

Birds

- Yeates, G. K.*—The Life of the Rook. (95 pp. + 16 pl.) London: Philip Allan, 1934, 10s. 6d.
- Blaker, G. B.*—The Barn Owl in England and Wales. (14 pp.) London: Royal Society for the Protection of Birds, 1934, 1s.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 5 August, 1934

NOTES FOR THE MONTH

A Successful Women's Institute Stall

MEMBERS of the Women's Institute movement in Northumberland, responsible for the Market stall held during the summer on Saturdays at Embleton, are to be congratulated on the excellent educational work they are doing in showing their producers how important it is to present goods in an attractive and hygienic condition. Those responsible for the organization have set up a high standard, and any sender who imagines that the stall is a dumping ground for produce not wanted at home is likely to be quickly disillusioned. A letter, setting out the "things that are not done," and the return of the offending produce, have caused surprise in more than one home, and had a salutary effect.

This is reflected in the records of the present season's sales. Supplies are drawn from the members of five institutes in the district, and there is competition to get produce taken at the stall. The stall-keepers' motto is: "It is your best produce, properly packed, that we want." The stall opens for 1½ hours on Saturday mornings in the summer, and there is usually a queue awaiting the opening. The first half-hour is described as "a real rush"; and the average takings for the morning amount to £9. The stall has its own meat safe for the protection of cooked foods, etc., and all the produce—chickens, honey, fruit, etc.—is protected by cellophane or other wrappers, while the jam pots carry the distinctive and attractive W.I. green and black labels. Some thirty members of the institutes take turns at selling, in accordance with a rota. At the recent Northumberland Show, a replica of the stall was staged in the W.I. tent; and, between 10 a.m. (the opening time) and 12.30 p.m., practically all the produce was sold.

Properly and firmly managed, the market stall can be

NOTES FOR THE MONTH

made really important. Its special value, ultimately, may be that, having set members a standard of presentation, the producers will be inclined to keep this standard for supplies sent to neighbouring stalls. The W.I. market stall, then, by reason of the fact that it demonstrates and educates, and only operates for a limited period each week, can act as a useful advertising medium for local produce sold, in the ordinary course of trade, in the local shops.

Marking of Imported Meat

AN Order in Council has been made under the Merchandise Marks Act, 1926, requiring imported chilled and salted beef, boneless beef and veal, frozen mutton and lamb, frozen and salted pork, and edible offals, to be marked with an indication of origin at the time of importation. The Order also requires that imported meat of these kinds, as well as imported frozen beef and veal, shall be marked with an indication of origin on exposure for sale and on sale, whether wholesale or by retail.

The Order will come into operation on January 7, 1935.

The Order in Council will be published as Statutory Rules and Orders, 1934, No. 727; and copies will be obtainable shortly from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh 2; York Street, Manchester 1; and 1, St. Andrew's Crescent, Cardiff, price 2d. net.

Fees for Seed Testing

CERTAIN reductions in the scale of fees charged by the Official Seed Testing Station, Huntingdon Road, Cambridge, which have operated experimentally during the past three years, have now been adopted permanently. The object is to encourage farmers and seedsmen to make greater use—to their own advantage—of the services of the Station.

A report on the purity and germination of a sample will, as hitherto, be furnished to *bona fide* English and Welsh farmers at the specially low rate of 6d. per sample. This rate applies only to seed that the farmer himself proposes to sow. The following reductions are offered to sellers who require information for the purposes of declarations that have to be made in respect of sales of seed subject to the provisions of the Seeds Act, 1920:—

Purity Tests only.—(a) Clover seeds (including examination for presence of Dodder), fee to be 3s. 6d. per sample. (b) All other seeds, fee to be one-half of that chargeable for a complete test (see below).

NOTES FOR THE MONTH

Garden, Vegetable and Root Seeds.—A 20-per-cent. rebate will be given on the existing fees for samples of garden, vegetable and root seeds received between August 1 and September 15 on condition that the Station is under no liability to test the samples immediately on receipt but is at liberty to fit the testing in at a convenient time.

Deposit Accounts.—Firms that have deposit accounts, and that send 400 samples or over during a season, will have a rebate of 15 per cent. credited to their accounts. Rebates at lower rates are also allowed when firms who have deposit accounts send over a minimum of 50 samples.

The fees chargeable to seedsmen for an ordinary complete test, as required for a declaration made under the Seeds Act, are as follows:—

	<i>s. d.</i>
Wheat, barley, oats, and rye per sample	2 0
All field and garden seeds, other than mangold, sugar beet, and garden beet, also linseed and flax "	3 0
Mangold, sugar beet, and garden beet	4 0
Grasses and clovers	5 0
Forest tree seeds	5 0
Mixtures of Grasses and Clovers	10 0

Note.—Perennial and Italian Rye-grass mixtures and mixtures described as "Alsike and White Clover grown together" will be tested as one kind of seed at the 5s. rate, but any mixture of Alsike and White clover not so described will be subject to the 10s. fee. A dodder test only will be made for 2s. 6d. In the case of Mangold or Beet an additional fee of 4s. will be charged if the percentage of sprouts is required in addition to the percentage of germinating clusters.

Interim purity reports will be sent on all grasses and clovers without additional charge as soon as the purity test has been made.

Additional charges are made for special examination for the presence of certain specified diseases, such as "bunt" in wheat or "leaf spot" in celery seed, and provision is also made by the Station for tests of special urgency.

Further details of seed testing arrangements, including the size of samples to be sent to the Station and the method of sampling can be obtained, free of charge, on application to the Ministry.

Colorado Beetle Regulations .

THE MINISTRY of Agriculture announced on June 28 that advantage had been taken of the presence in this country of delegates from the French Ministry of Agriculture to discuss certain sanitary regulations then in force affecting the exchange of agricultural and horticultural

NOTES FOR THE MONTH

produce between the two countries. Those regulations prohibited (a) the importation of any potatoes grown in France, (b) the importation between March 15 and October 14 of any raw vegetables grown within 200 kilometres of an outbreak of Colorado Beetle, (c) the importation during the whole year of any plants, etc., grown within the same distance of an outbreak. The regulations made by the French Government prohibited entirely the importation of British plants and potatoes into France and Algeria.

After a careful examination of the latest technical information the Minister has decided (a) that he is justified in allowing the importation of raw vegetables (other than potatoes), plants, etc., grown more than 50 kilometres from any "zone de protection" established by the French Government against the Colorado Beetle; and (b) that the period during which raw vegetables are admitted without a certificate can be extended generally to April 7, and to April 20 in the case of vegetables grown in certain departments in the northern part of France. An Order giving effect to these decisions was in preparation, and would come into force on July 1.

The French Government had decided as from the same date again to permit the facilities previously existing for the importation of British seed potatoes into France and Algeria.

Implement and Machinery Demonstration at Sparsholt

A DEMONSTRATION of implements and machinery and poultry appliances was held at the Hampshire Farm Institute, Sparsholt, on June 26 and 27, 1934. The demonstration was divided into five sections:—

- (1) Haymaking and grass-silage-making machinery.
- (2) Tractor row-crop work.
- (3) Horticultural tractors and attachments.
- (4) Milking machines.
- (5) The poultry folding unit system.

In all sections but the last, the implements and machinery were shown at work.

The Farm Institute, which is situated on the chalk formation typical of much of the farm land of Hampshire, formed a most suitable background for the demonstration, since visitors were able to compare the work performed at the Farm with the similar conditions that applied to their own holdings.

NOTES FOR THE MONTH

Amongst the haymaking machinery demonstrated were the new type of power take-off mowers, as well as the simpler trailer pattern, adapted from the horse-drawn machines; hay sweeps, both with tractor and motor-car; a machine designed to handle grass in the green state; and one process of making grass silage.

The demonstration of row-crop work included tractors with wheels adjustable to the width of the row and one with fixed wheels. The machines were shown hoeing sugar-beet and potato ridges and baulking up potatoes.

The horticultural tractors were shown at cultivation work in the garden and mowing in the poultry pens, as well as doing row-crop cultivation in the sugar-beet in order to assess their possibilities for this work on large farms.

Milking machines are well known and widely used in Hampshire, and the exhibit proved very popular.

The folding unit system of poultry keeping was demonstrated in such a way as to allow visitors to inspect the houses and test the mobility of each design. A Silver Medal, a Bronze Medal and a Certificate of Merit were awarded after the different patterns had been adjudicated on by three judges, Dr. H. J. Denham, Director of the Institute for Research in Agricultural Engineering, Mr. P. A. Francis, Poultry Commissioner to the Ministry of Agriculture, and Mr. A. W. Grimes, the County Poultry Instructor, and the awards were posted on the houses before the demonstration.

In the haymaking section, car sweeps were found to be generally preferred to those worked by tractors, because they worked at a higher speed and brought in smaller and less tangled loads which could be handled more easily on the rick. The general standard of work of the row-crop implements was high, judged visually. A short-length machine that needed less room when turning on the head-lands aroused considerable interest.

The horticultural tractors put up an excellent show.

The organizers of the demonstration are satisfied that visitors appreciated the opportunity of observing the various implements designed to do the same or similar work, working side by side with one another so that they could make a comparison of the performance, and feel sure that demonstrations of this type are of very considerable educational value.

The demonstration was well attended, there being about

NOTES FOR THE MONTH

1,000 people present on the first day and about 500 on the second, and from the observations made by some of these visitors, it is clear that demonstrations of this kind are not only popular, but instructive.

Young Farmers' Clubs: International Dairy Cattle Judging Competition

THE thirteenth Annual International Dairy Cattle Judging contest was held at the Royal Show at Ipswich on July 4. teams representing Northern Ireland, Wales and England took part, and Mr. Robert Hobbs, Professor Robert Rae, and Professor J. A. S. Watson again acted as Judges.

The competitors were required to judge eight rings of cattle, and, in relation to four of the rings, to appear before the Judges to give reasons for their placings. Great interest in the proceedings was shown by the spectators, many of whom watched the contest throughout.

The *Daily Mail* Gold Challenge Cup was won by the team representing Northern Ireland with a score of 1,544 points out of a maximum of 2,160. The best individual score was made by O. A. Gorman of the same team.

The full scores were as follows:—

Teams (Maximum 2,160).

1. Northern Ireland	..	..	1,544
2. Wales	..	..	1,439
3. England	..	..	1,404

Individual Scores (Maximum 720).

1. O. A. Gorman (N. Ireland)	..	538
2. R. J. McBriar	..	520
3. J. W. Vickers (England)	..	506
4. Gwladys Lougher (Wales)	..	500
5. R. Thompson (N. Ireland)	..	486
6. M. Laidler (England)	..	483
7. D. Davies (Wales)	..	474
8. E. Williams	..	465
9. W. Wells (England)	..	415

The *Daily Mail* again awarded silver medals to the members of the winning team and bronze medals to members of the team taking second place. The Royal Agricultural Society awarded a certificate to each competitor.

After the contest the Judges explained the various points which they had taken into consideration in judging the cattle in the various rings and gave their placings. They paid tribute to the high standard attained by the competitors and to the great value of the Young Farmers' Clubs movement.

The awards were presented by the President of the Society, the Rt. Hon. the Earl of Stradbroke, K.C.M.G.

NOTES FOR THE MONTH

Resistance Seed Oats

THE National Institute of Agricultural Botany are offering for sale approximately 1,000 qr. of a new oat—"Resistance"—which is being introduced to meet the requirements of soils in high fertility. Orders are invited from members of the Agricultural Seed Trade Association, the National Association of Corn and Agricultural Merchants, the National Association of British and Irish Millers, and other established dealers in seed corn. The new variety, bred by Dr. Herbert Hunter, of the Cambridge University Plant Breeding Institute, is the product of a cross between Grey Winter and an Argentine oat possessing a remarkably clean, stiff straw. Resistance, which has foliage erect in habit and of a distinct pale green colour, possesses high tillering capacity and produces short, stiff straw that resists lodging to the highest degree. Its panicles (heads) approximate to the open type, and the grains are of a creamy-white colour, three grains per spikelet being common. Sown in the autumn, it usually ripens rather earlier than either the Grey Winter or Black Winter varieties: spring sown, it ripens a day or two later than Victory. The husk percentage is some 7 per cent. higher than that of Grey Winter, being, in fact, similar to that of Victory and most other winter and spring varieties, but this is compensated for by its greatly increased yield. The proportion of tail to head corn is rather higher than in most other varieties, but, since the small grains of oat spikelets are nearly always thinner in husk than the large grains, this is no detriment.

The yield capacity of Resistance was tested at the six sub-stations of the N.I.A.B. in the winter-sown trials, under field conditions, of 1931-32 and 1932-33, and the average yield was higher than that of any other oat in these trials; for the two seasons, it showed an average dry weight increase of 32 per cent. over Grey Winter. Similarly, tested in the spring-sown trials of 1933, the yield was slightly higher than that of Victory, the control variety.

Experience in the cultivation of Resistance indicates that it does best on soils of high fertility, and, on account of the exceptionally resilient straw, may be sown on rich land where other sorts would almost certainly lodge badly. Clean land is essential, however, since its capacity to suppress weeds is less than that of longer-strawed varieties. Winter hardiness tests, both under field and artificial conditions, show that, though at least equal to Bountiful, it is

NOTES FOR THE MONTH

less hardy than Grey Winter; and, for this reason, it is not recommended for autumn sowing north of the Humber, or in very exposed positions elsewhere that require extreme winter hardiness. All available evidence, however, goes to show that it is at least as winter hardy as any white oat on the English market.

Applications for particulars should be addressed to the National Institute of Agricultural Botany, Huntingdon Road, Cambridge.

Official Statistics.

BLUE Books and White Papers have lost much of their mystery in recent years. The references to facts and figures obtained from official sources which appear almost daily in the press make the extensive nature of the statistical information collected by Government Departments a matter of common knowledge. But the inquirer who wishes to ascertain for himself precisely what figures are available on a particular subject, and where they are to be found, needs an alphabetical index to the contents of all official publications containing statistics.

This need is met by the *Guide to Current Official Statistics* published annually by H.M. Stationery Office. *Volume Twelve*, which has just been issued (price 1s. net, post free 1s. 5d.), consists of a systematic index of nearly 300 pages to the statistical publications of 1933, giving details of the information which they provide on each subject. The source of the statistics is indicated by a simple system of key numbers referring the inquirer to a list of the titles and prices of the volumes indexed; and an indication of the wide scope of the data covered by the *Guide* is afforded by the fact that this list occupies a further 50 pages.

Volume Twelve of the *Guide* may be obtained direct from the sale offices of H.M. Stationery Office or through any bookseller. Certain of the earlier volumes, dealing with the statistics of previous years, are also available at the same price.

NEW TYPE OF SPRAY FOR FRUIT TREES

J. TURNBULL,
Ministry of Agriculture and Fisheries.

IN describing "New Methods of Spraying Fruit Trees" in this JOURNAL for February last, special attention was drawn to the type of spray that appeared to give the best results under ordinary farm conditions. During the past spraying season, the matter has been studied further, with the object of improving the spray. Acting on the belief that the men who have to do the work, must have useful ideas on the best way of doing it, every point has been discussed in detail with them. There is no mistaking the general consensus of opinion.

There was plenty of criticism of every type of spray. The wide V-shaped spray, traditionally correct, was condemned, because the wide end of the spray obscured the work being done. The most important point was great "carry," so that short lances could be used. It was surprising to find what a very narrow spray a man would use, if allowed to get good carry and a short lance. A very narrow spray is satisfactory for winter washing, but is apt to lead to missing in summer work, for which something wider is needed. The difficulty is to combine width with length. Adjustable nozzles have the unfortunate habit of adjusting themselves while in use, with the result that the wrong type of spray is being used for a large proportion of the time. Guns changed too quickly from a wide to a very narrow spray, and it was almost impossible to synchronize alteration in adjustment with other movements. Double adjustable nozzles gave a good type of spray and were liked by the spraymen, but they suffered from several defects. Very few had sufficient carry, and those that had would not maintain the same spray for long. They were too heavy, and the "U" piece was easily broken when hit against a branch. What was wanted was a fixed spray, which could not be altered and used wrongly; a good width throughout the length (and therefore two, or more nozzles); and, above all, a maximum carry.

In order to ascertain whether such a spray could be produced by modifying an existing type of fixed nozzle, a

NEW TYPE OF SPRAY FOR FRUIT TREES

double nozzle of the common disc pattern, made of duralumin, was selected for trial. A local firm of engineers, Messrs. Drake and Fletcher, of Maidstone, made nozzles and altered them from time to time. Each alteration was tried out on a farm, while ordinary spraying was in progress, and its effect noted. The effect was gradually to increase the carry and diminish the width. Finally a point was reached, beyond which it did not seem desirable to go for a general-purpose spray, because the force in the spray might cause damage to the foliage if the nozzles were held too close to it. The type of spray chosen starts to widen at less than a foot from the nozzles, where the two sprays meet, attains a width of 2 ft. (with a few inches of flying spray on each side) at less than 3 ft. from the nozzle, and maintains that width throughout its length. The length varies with the pressure and also apparently with the capacity of the pump. With a good 4-h.p. outfit working at a pressure of 250 lb. per sq. in., two double nozzles being used, the effective "carry" is about 15 ft. This is a very good combination of width and length.

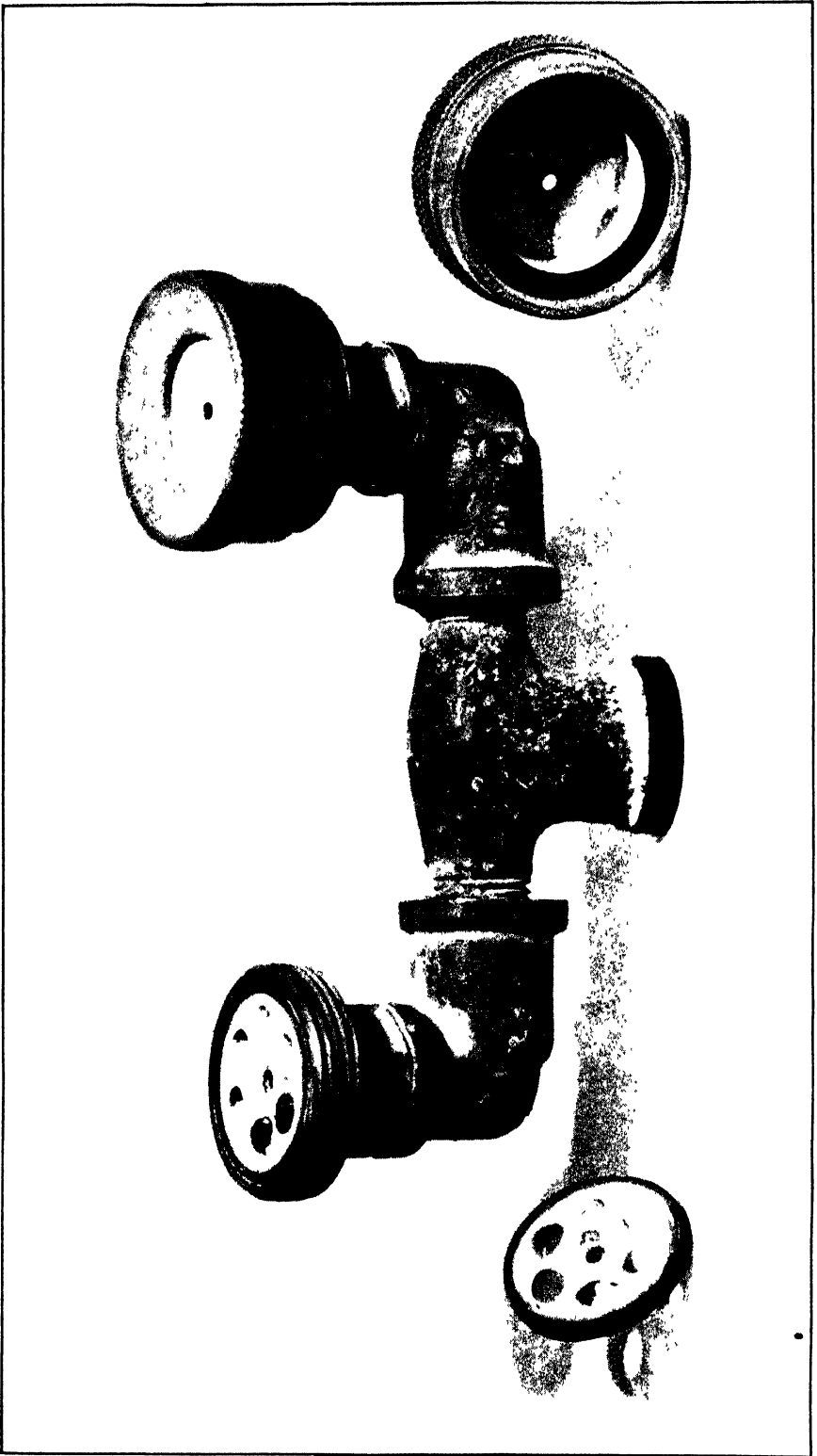
This fixed double nozzle has been thoroughly tested on all kinds of trees from 10 to 30 ft. high, and has proved satisfactory. It was used throughout the season in the Commercial Spraying Demonstration, carried out in co-operation with Mr. W. G. Kent (Kent County Horticultural Officer,) on 30-ft. trees on the farm of Mr. H. Payne (West Farleigh, near Maidstone). Using it on 6-ft. lances at 250-lb. pressure, the tops of the trees were sprayed satisfactorily. The tallest apple trees can be sprayed with it on 6-ft. lances, at a pressure of 400 lb. For trees up to 15 or 18 ft., according to pressure, a 2-ft. lance is better and avoids the nozzles being held too close to the foliage.

In using these, or any other, nozzles, it is important to choose the correct size of discs. For ordinary farm use, when giving a *light spray*, the following are recommended:

Trees.		Pressure	
		250 lb.	400 lb.
10-15 ft.	..	No. 1 Disc.	No. 0 Disc.
20-30 "	..	" 2 "	" 1 "

For a *wetting spray*, or adverse weather conditions, a size larger is required. Skilled men can use larger sizes, especially if not more than two or four men are working together.

The illustration shows the nozzle actually used and there



To face page 434.

NEW TYPE OF SPRAY FOR FRUIT TREES

are several adjustable parts, which can be made solid. The details of construction are as follow:—

“ U ” Piece.—A good “ U ” piece should be made of a tough alloy, cast in one piece, preferably including the lower parts of the two nozzles in the casting. This will avoid leaky joints and danger of breaking, shorten the complete double nozzle, and save weight. It should not hold the nozzles quite straight, but at an angle of 15 deg. with the lance, and the nozzle centres $3\frac{1}{8}$ in. apart.

Nozzles.—The lower part, which, as stated above, would be better cast as part of the “ U ” piece, are 1 in. diameter inside, with shoulder $\frac{1}{4}$ in. wide and $\frac{1}{4}$ in. down, so as to hold the swirl plate level with the top. The nozzle cap is made of a light alloy, such as duralumin, of a size to screw on to the lower part. It should be $9/16$ in. deep inside, which is $\frac{1}{4}$ in. deeper than shown.

Swirl Plates.—These are of brass $\frac{1}{4}$ in. thick, nearly 1 in. diameter, to be a fairly close fit in the lower part of the nozzles. The type of spray depends mainly upon the size and shape of the holes, and the plate is made reversible. The six outer holes are drilled a full $11/64$ in. (actual size 0.177 in.) at an angle of 45 deg. and $\frac{1}{4}$ in. from outer edge of plate. Each hole is filed by hand at its forward end, on both sides of the plate, so that the liquid enters the swirl chamber at a flat angle and is directed to the outside. The centre hole is drilled a close $7/64$ in. (actual size 0.110 in.) and is given a wide flat bevel (fully $\frac{1}{4}$ in., as shown). If this central hole is made slightly larger, the carry and force of the spray will be increased and width diminished.

Discs.—These fit into the top of the cap, and sizes that have been found most useful for 0, 1 and 2 are made with full $3/64$, $4/64$ and $5/64$ -in. drills, each being about $1/128$ in. oversize.

Rubber Washers.—These are made of oil-resistant rubber, fit inside the nozzle cap fairly tightly, are $\frac{1}{4}$ in. deep, $\frac{1}{4}$ in. wide, and about $\frac{7}{8}$ in. internal diameter. They hold the disc at the correct distance from the swirl plate. Being of rubber, there is no leak when the cap is finger tight, and the caps are quickly removed for cleaning.

Lances.—Lances used should never be longer than is necessary: 2-ft. lances are best for small and medium trees, and 4-ft. or 6-ft. lances for tall trees. It is a good plan to cover the lower 2 or 3 feet with wood, bored to take the lance. This gives a good grip.

LAND IMPROVEMENT BY WARPING

A. G. RUSTON, B.A., D.Sc.,

Department of Agriculture, University of Leeds.

WARPING may be defined as the artificial improvement of low-lying level ground, in the vicinity of tidal estuaries, by deposits of rich alluvial matter brought in with the tidal flow and distributed by its careful regulation. In this country, the method has a history of little more than 150 years, although it has long been known and practised on the Continent; while Egypt has furnished, from time immemorial, an example of a similar process, under another name, in the periodic inundation of lands bordering the Nile, converting what would otherwise have been an arid waste into one of the most fertile regions in the world.

Warping is, of course, the application of a process that occurs naturally. The waters of the Ouse, Trent, and other associated rivers converging into the Humber, hold in suspension a large quantity of rich earthy particles, locally termed "warp," and this, deposited along the banks of these rivers, has formed a covering of most fertile soil upon the original sandy or peaty waste. Much of the land in the neighbourhood has thus been naturally warped; and, since Vermuyden* drained this area and brought it into cultivation, much has been warped artificially.

One of the earliest descriptions of artificial warping in this country is that furnished by Mr. Ralph Creyke, junr., to the Society of Arts,† of his "improved method," for which the Society awarded him their Gold Medal in 1825. Mr. Creyke, who resided at Rawcliffe House, stated that there were in the neighbourhood many thousands of acres of peat moss and waste land, yielding scarcely any annual rent, which he thought, from experience gained in improving a considerable quantity of his own land near home,

* Sir Cornelius Vermuyden, the Dutch Engineer, who drained Hatfield Chase for James I in the second quarter of the 17th century

† Extracts from Creyke's statement to the Society of Arts, with many details of his work at Rawcliffe, are given in "Improvement of Land by Warping, Chemically Considered," by Thornton J. Herapath *Jour. R A S E*, No XXV, 1850, pp 93-113.

LAND IMPROVEMENT BY WARPING

might be improved very much by warping. Accordingly, he undertook to warp 1,600 acres of it from the River Ouse.

In August, 1821, he erected, at a point on that river, a sluice or "clough," with two openings, each 16 ft. wide and 19 ft. high (from the sole to the crown of the arch), these openings being fitted with substantial folding doors. The sluice was built of stones of large size, backed with brick, upon a foundation consisting of 550 piles, each 11 in. square and 13 ft. long, to which very strong beams were secured. Upon these beams, there was a flooring of 4-in.

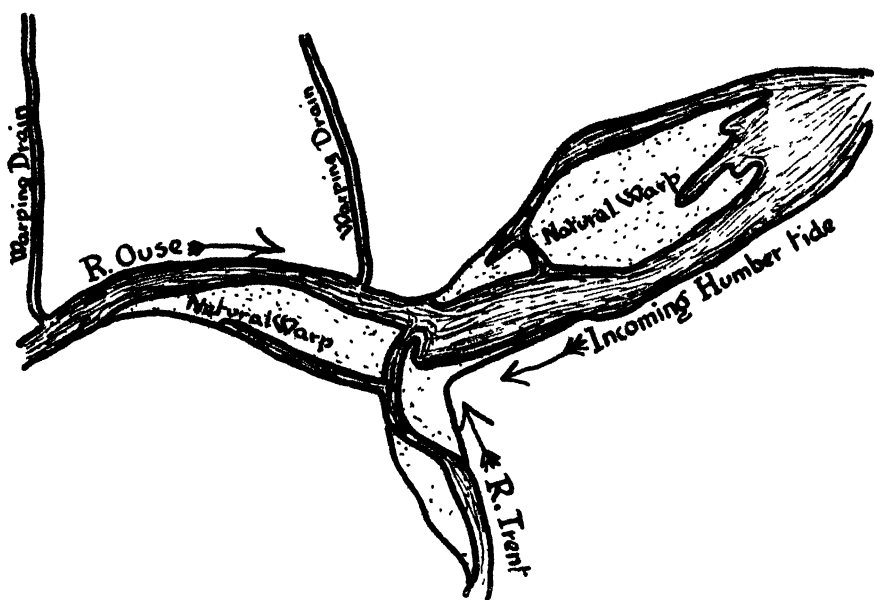


Diagram map, showing junction of Rivers Ouse, Trent and Humber.

deal planks, then another set of beams placed crosswise, and above that another flooring of 3-in. planks to receive the masonry. This foundation was also sheet-piled round on the river side and against the main warping drain, and walls were also constructed between the sluice and the river to protect the river bank. The main warping drain, cut at the same time, extended from the sluice $2\frac{1}{2}$ miles up to the waste land and peat moss. It is explained that the banks to retain the tide water (the length of the banks depending upon the quantity of land to be treated), must be well puddled and made with the greatest care. Their dimen-

LAND IMPROVEMENT BY WARPING

sions, in this particular work, were 32 ft. wide at the base, 10 ft. high and 6 ft. wide at the top.

Creyke carried out his warping of the 1,600 acres in three sections, the first, extending to 420 acres, being warped in 1821 and covered with a deposit of soil to a depth of 3 ft. The other two, of 500 and 671 acres respectively, were



The " Clough " at Blacktoft.

warped in 1823, and so successful was the undertaking that the land, previously entirely unproductive, yielded abundant crops in the course of four years, and readily let at 35s. per acre. The cost of the operations was considerable, and is detailed as follows:—Sluice or clough and its appendages, £5,500; main warping drain and embankment (2½ miles long), £7,350; and banks round the three compartments, £4,662; a total of £17,532. This works out, approximately, at £11 per acre.

LAND IMPROVEMENT BY WARPING

Since Creyke's time, at least 20,000 acres of land in the Humber basin have been warped. In general, the cross-sectional area of the main warping drain should be sufficiently large to prevent any considerable resistance to the flow of water; usually, it is made three times the size of the sluice. The dimensions of the bank enclosing the compartments to be warped are commonly 2 to 3 ft. wide at the top, with a slope of 15 in. to 18 in. horizontal to 1 ft. perpendicular. The flood gates, which open outwards towards the river estuary (against the incoming tide), are opened before, or just after, the inland flow of the tide has begun. When the tidal flow is about to turn, the water is retained in the warping drain by lowering the shuttle or slide on the drain side of the sluice, the shuttle being raised some hours later to let the clear water escape into the river at low tide, in preparation for the next inward tide.

High labour costs and low selling prices for produce have, in most instances, made land reclamation an uneconomic proposition. When the attention of the farming community does turn in the direction of such improvement, it is invariably because there are ideal physical conditions, and because the land, when improved, will be capable of growing a large number of comparatively high-priced sale crops, that, to a greater or lesser degree, are protected, on account of perishability or bulk, from undue foreign competition.

Yorkshire possesses an area with ideal conditions for warping, where the waters of the Ouse, flowing through the fertile plain of York, and those of the Trent, flowing through the rich Red Keuper marl, meet the incoming tide of the Humber laden with the detritus of chalk from the east coast of Yorkshire. A good warp soil, it should be noted, will produce excellent crops of potatoes, sugar-beet, mustard, peas for picking green, and even flax.

Yet, given such conditions, with the present high cost of labour, warping to-day, even to really progressive men, would prove an uneconomic proposition if the clough and main warping drain have to be constructed, although it can still be made a paying proposition if these are already in existence.

In 1911, 89 acres of land near the river were treated by warping. This land had never previously been warped, but had a main warping drain adjacent, with the clough already fixed.

Land Improvement in Warping

The total cost, not including the loss of rent during the two years the land was warped, was as follows:—

Wages, forming banks round land to be warped and pitching new farm roads	£ 343
Wages, clearing out old main warping drain and looking after warping during two years	91
Stone for roads	65
Total	<u>£499</u>

or, roughly, £5 10s. per acre.

In 1912, 621 acres, which had been warped about 80 years previously and round which containing banks already existed, were again treated at a cost of:—

Clearing out of old warping drain	£ 113
Repairs to clough	41
Repairs to banks round compartments	218
Total	<u>£372</u>

or little more than 12s. per acre—an unusually low figure. It must be remembered, however, that no new roads were necessary, as the existing ones were not covered, having been made high enough at the previous warping; that the original banks round the area to be warped had been left standing; and that the clough and main warping drain were already in existence.

Since the War, Major Empson, of Yokefleet, appears to be the only man who has been bold enough to tackle the problem of *rewarping*. In 1925-26, some 37 acres were treated at Gowthorpe, at a total cost of £463, including loss of rent—or £12 10s. per acre—a venture which, when the increased rental charged is taken into account, gave a net return of £6 18s. 3d. per cent. on the capital investment.

In the following year, 140 acres, including Rushy Field, which had not previously been warped, were treated at a total cost of £2,651, or £19 an acre—a venture which left a return of £4 19s. per cent., and, one year later, 62 acres on Church Field Farm were rewarping at a cost of £836, or £13 9s. 6d. per acre, which, again, taking the increased rental into account, shows a net return of £6 6s. 8d. per cent. on the capital commitment. The last tide on this land was admitted on July 25, 1930, and, after allowing for consolidation, the land was sown down with rye grass early in September.

For the landlord, warping, under ideal conditions, may, therefore, leave a reasonable return on the capital outlay



Making the Bauls



Running in the tide

Photos A G Ruston

LAND IMPROVEMENT BY WARPING



Dearest ! It when the tide is run off

Photo A G Ruston

LAND IMPROVEMENT BY WARPING

(averaging roughly, £15 an acre), where the original main warping drain and clough are still in existence. As regards the tenant farmer, where the warping has been carried out at the landlord's expense, and an increased rent charged to give a reasonable return upon the capital cost, the economic return is usually still more satisfactory.

At Staddlethorpe Grange, rented by Mr. Winn, two lots of land have recently been warped, one completed in 1926 and the other in 1932. In the first instance, 43 acres of grass land were under treatment, since when no manure of any kind has been added to the land. In 1927, five cuts of rye grass were taken. In 1928, a good year for potatoes as far as yields were concerned, but a poor one for prices, there were lifted from the 43 acres a total of 461 tons, a yield of 10 tons 15 cwt. per acre, the sales from which realized a total of £1,648. In 1929, the field was again under potatoes, yielding approximately 8 tons to the acre. In 1930, the crop was mustard, grown under contract with Messrs. Colmans. The mustard was drilled at the rate of 2 stone of seed per acre and threshed out at rather more than $3\frac{1}{2}$ qr. to the acre, the contract price being £4 15s. per qr. In 1931, a second crop of mustard was grown, the yield of which was little more than $2\frac{1}{2}$ qr. to the acre. In 1932, wheat was sown, the varieties being Wilhelmina and Iron. An excellent sample of fine millable grain was produced and sold, the whole crop threshing out at rather more than 5 qr. to the acre.

In 1933, the field was split up and put under a variety of sale crops:—

6 acres were under peas for picking green; from these 1,100 40-lb. bags were harvested and sold at an average of 3s. 6d. per bag.

7 acres under mustard, which, owing to the dry summer, did not do well, threshing out at little more than $1\frac{1}{4}$ qr. per acre.

30 acres were under sugar-beet which, in early September, looked like lifting at 14 tons to the acre, representative samples weighing from 3 to 5 lb. each. The factory returns, however, for the crop harvested in October, showed an average yield of 10 tons 15 cwt. per acre of clean beet, with a sugar content of 19.2 per cent.

This year (1934), 23 acres are under wheat that, at the time of writing (July) is looking particularly well and gives every promise of a yield of 6 qr. to the acre. 10 acres are under sugar-beet, again looking well, with promise of at least 10 tons to the acre; and the remaining 10 acres are under mustard, the estimated yield of which is $2\frac{1}{4}$ qr. to the acre.

Before the land was warped the rent stood at 35s. per acre; after warping it was increased to 50s. During the warping operations, carried out entirely at the landlord's

LAND IMPROVEMENT BY WARPING

expense, no rent was paid, although, of course, the use of the land for two seasons was lost.

Recent changes in the National Policy with regard to the industry, and the improving agricultural outlook, make one wonder whether the bold policy, adopted with success by Major Empson, would not be well worth a trial by other landowners.

There are thousands of acres of valuable land in this area, on either side of the Market Weighton Canal, in the valley of the Derwent, of "deaf carr" along the banks of the River Hull—but the land is less than 10 ft. above sea level and so subject to flooding that pumping operations have, in some instances, to be resorted to almost continuously. By means of warping drains, still in existence these lands could, within 10 years, be reclaimed, covered to a depth of from 2 to 3 ft. with the richest alluvial deposit imaginable, and their rental value raised from 15s. to 40s. or 50s. per acre.

On the other hand, warping is not foolproof; risks, and expensive risks, must be taken, the man in charge must know his job, levels must be studied, and a careful watch placed on the tide range.

LIVE STOCK IMPROVEMENT SCHEME:

REPORT FOR THE YEAR ENDED MARCH 31, 1934

THE chief matters of importance, in connexion with the live-stock industry, that had direct influence in 1933-4 on the Ministry's Live Stock Improvement Scheme were the low prices that ruled for beef cattle, the setting up of the Milk Marketing Board, the increased prices and greater interest in pig breeding as a result of the operations of the Pigs Marketing Board, and the rise in the prices of heavy horses consequent on the demand being more in keeping with the supply. These points will be referred to later in the different sections of this Report.

Licensing of Bulls.—An important step in connexion with the improvement of the general quality of the cattle of the country was taken in November, 1933, when August 1, 1934, was appointed as the day when the Improvement of Live Stock (Licensing of Bulls) Act, 1931, would be brought into force in England and Wales. This was the earliest date allowed by the Act. A Committee consisting of seven members was appointed by the Minister to advise him on matters connected with the administration of the Act. Sir Merrik R. Burrell, Bart., C.B.E., J.P., is Chairman of the Committee, and of the other members, three were nominated by the National Cattle Breeders' Association and three by the National Farmers' Union. The procedure under the Act is governed by Regulations; these were considered in draft by the Committee and were made on March 12, 1934.

The Act provides that no bull that attains the prescribed age on or after the appointed day shall be kept without a licence or permit, and the age prescribed in the Regulations is 10 months. A bull that attains the age of 10 months on or after August 1, 1934, may not, therefore, be kept after it reaches that age unless a licence or permit has been obtained for it. The Act does not apply to bulls that were over 10 months old on August 1, 1934.

The Regulations provide that the application for a licence shall be made not later than 28 days before a bull attains the prescribed age of 10 months. An application for a

LIVE STOCK IMPROVEMENT REPORT

licence must be made on the prescribed form and a fee of 5s. is payable in respect of each bull.

Every bull in respect of which an application for a licence is made will be inspected by an Officer of the Ministry. Inspection will normally take place on the premises of the bull owner, and under the Regulations bull owners will be required to provide all reasonable facilities and assistance for the purpose of the inspection and marking of their bulls. A bull that is passed for licence will be tattooed in the right ear with a crown and identifying letters and numbers, and a bull that is rejected for licence will be tattooed in the left ear with the letter " R."

A licence will not be granted in respect of a bull that appears to be:—

- (a) of defective or inferior conformation and likely to beget defective or inferior progeny; or
- (b) permanently affected with any contagious or infectious disease; or
- (c) permanently affected with any other disease rendering the bull unsuitable for breeding purposes.

If a bull appears to be temporarily affected by a disease or defect rendering it unsuitable for breeding purposes a notice of suspension will be issued with the licence prohibiting the use of the bull for breeding purposes for a specified period. In accordance with the powers given to him in the Act, the Minister will require the slaughter or castration of any bull for which a licence is refused, unless a permit is granted to keep the bull for a limited period for fattening purposes.

The owner of a bull in respect of which a licence is refused or suspended may appeal against the Ministry's decision within 14 days from the date of the refusal or notice of suspension. When an appeal is lodged the bull will be inspected by one or more members of a panel of referees. The panel of referees will consist of persons recommended by the National Farmers' Union and by the Cattle Breed Societies. The fee payable in respect of an appeal against the refusal or suspension of a licence will be two guineas, and this fee will be returned to the bull owner if the appeal is successful.

The Ministry has issued for the guidance of bull owners a booklet under the title, " Guide to the Licensing of Bulls in England and Wales," in which the procedure regarding the licensing of bulls is set out in detail. This booklet is issued free to bull owners on application to the Ministry,

LIVE STOCK IMPROVEMENT REPORT

and copies can also be obtained from the Secretaries of Branches of the National Farmers' Union and from Cattle Breed Societies.

Inspection of Canadian Cattle.—Arising out of the provision of the Ottawa Agreements Act, 1932, giving the Minister of Agriculture and Fisheries power to order the slaughter of any cattle, imported from Canada, that could be used for breeding and were not suitable for that purpose, the Live Stock Officers of the Ministry or of the Department of Agriculture for Scotland inspected all cattle that were landed from Canada during the year and were capable of being used for breeding.

The total number of cattle landed from Canada in the 12 months ended March 31, 1934, was 55,765, including 49,395 steers. Of the 6,370 animals capable of being used for breeding, 1,498 were rejected as not being of sufficiently good quality to permit of their entry into this country for breeding purposes, and these were ordered to be slaughtered. Of the cattle rejected, 1,040 were bulls, and only 59 bulls were passed as suitable for breeding purposes in this country.

Premium Bulls.—The low prices that ruled for cattle during the year under review have had a depressing effect on breeders, and as a result some farmers, who had previously taken sufficient interest in their stock to send their cows to the premium bulls, have been content to use the nearest bulls if the service fees charged were low, irrespective of their breed or quality.

The farmers with whom the premium bulls have been located for the use of the Bull Societies have also felt the effect of the low prices and, in a number of instances, Societies have had to cease operations because the farmers who provided the bulls have not been in a position to replace them with animals of sufficient merit for the award of premiums.

The greater stability in milk prices and the more remunerative outlet for milk produced on outlying farms, as a result of the operations of the Milk Marketing Board, have resulted in many farmers, who had previously bred and reared cattle, turning their attention to the sale of milk. Unfortunately, this change in practice frequently leads to the introduction into a district of cows of many types and the formation of very mixed herds of cows, which tends to the breeding of nondescript stock and indifference as to the type of bull used.

LIVE STOCK IMPROVEMENT REPORT

The general appreciation of the value of using bulls of good quality and the relatively better prices received for the progeny of such bulls is, however, evidenced by the fact that the average number of services by the premium bulls in 1933-34 was only one less than in the previous year, and the number of Bull Societies in operation increased by 17.

TABLE I.
NUMBER OF BULLS SUBSIDIZED EACH YEAR SINCE THE COMMENCEMENT OF THE SCHEME.

<i>Year</i> <i>(April 1-</i> <i>Mar. 31).</i>	<i>No. of</i> <i>Bulls.</i>	<i>Year</i> <i>(April 1-</i> <i>Mar. 31).</i>	<i>No. of</i> <i>Bulls.</i>
1914-15 ..	497 ..	1924-25 ..	1,069
1915-16 ..	633 ..	1925-26 ..	1,175
1916-17 ..	659 ..	1926-27 ..	1,287
1917-18 ..	710 ..	1927-28 ..	1,372
1918-19 ..	721 ..	1928-29 ..	1,408
1919-20 ..	675 ..	1929-30 ..	1,476
1920-21 ..	668 ..	1930-31 ..	1,537
1921-22 ..	847 ..	1931-32 ..	1,494
1922-23 ..	947 ..	1932-33 ..	1,452
1923-24 ..	978 ..	1933-34 ..	1,469

The average number of services per bull in 1933-34 was 65, and the total number of cows served by the premium bulls was nearly 90,000, belonging to 22,000 different owners. On the average the number of persons sending cows to each bull was 15 in England and 20 in Wales, and the average number of cows per sender was $4\frac{1}{2}$ in England and $3\frac{1}{2}$ in Wales. These figures are a clear indication that, as is intended, the premium bulls are used by small farmers who keep only a few cows, and there is no doubt that, were it not for the provision of the premium bulls, most of these farmers would have no opportunity of securing the use of good bulls for the service of their cows.

Premium bulls and their progeny were again in 1933 well to the fore at Agricultural Shows, and the long list of prizes won bears testimony to the high standard of the bulls provided under the Scheme and their ability to pass on their good qualities to their progeny. Small farmers are fortunate to have the use of such bulls at the very moderate service fees which the Ministry's grants make it possible for Societies to charge. Premium bulls secured two first prizes at the Royal Show, and several first prizes were also obtained at the Royal Welsh and Bath and West Shows, while, as has often happened in the past, several premium bulls were awarded championship prizes at County Shows.

LIVE STOCK IMPROVEMENT REPORT

A heifer sired by a premium bull secured a second prize at the Royal Show, and a first prize was awarded at Birmingham Fat Stock Show and two second prizes at the Smithfield Fat Stock Show to the progeny of premium bulls, while several young Devon Bulls sired by premium bulls were sold at prices ranging from 40 to 66 guineas at the Breed Society's Sales at Exeter. Classes for premium bulls and their progeny are provided at a certain number of Shows and attract considerable attention; they are a useful means of drawing the attention of farmers to the value of the Scheme.

The Welsh Dragon Mark Store Cattle Association, which was formed by Bull Societies in the counties of Brecon, Radnor and Monmouth, for the purpose of tattooing calves sired by premium bulls, with the object of improving their sale value later as store cattle, has continued to receive satisfactory support, and the Association's scheme received favourable comment in the report of the Reorganization Commission for Fat Stock. The first advertised sales of Welsh Dragon marked cattle were held at various markets in the counties covered by the Scheme during April last, and a number of graziers from the Midland counties of England attended these sales and thus were able to make their purchases direct from the breeders. It is hoped that these sales will prove a success from the point of view of both the breeders and the graziers. The Schemes for the earmarking of calves sired by premium bulls of the Bletchley and District Live Stock Improvement Society and of some Bull Societies in Staffordshire have also made satisfactory progress during the past year, and these schemes, which are operating in districts where Dairy Shorthorn bulls are kept, have been useful in encouraging breeders to keep their heifer calves for breeding purposes and so gradually to raise the quality of their herds.

Breeds and Prices.—Table II (p. 448) gives the number and average prices of the premium bulls of each breed located in each of the past three years.

The average price paid for the subsidized bulls again shows a decrease. To some extent this decrease is due to the inability of certain owners of premium bulls to afford to purchase as good bulls as formerly, but as a result of the low prices ruling for cattle generally, pedigree bulls have been cheaper during the past year, and it is evident that

LIVE STOCK IMPROVEMENT REPORT

TABLE II.
NUMBER AND AVERAGE PRICES OF PREMIUM BULLS.

Breed	1931-32				1932-33				1933-34			
	No.	Average price			No.	Average price			No.	Average price		
		£	s.	d.		£	s.	d.		£	s.	d.
Aberdeen-Angus	8	43	15	6	5	46	12	10	6	39	12	0
British Friesian	3	65	4	0	1	52	10	0	2	59	7	6
Devon . .	185	52	2	2	183	49	0	0	193	47	8	0
Galloway	2	36	2	6	2	36	2	6	3	27	6	0
Guernsey	20	43	18	10	23	41	19	7	28	37	8	5
Hereford	193	44	18	2	205	41	12	3	213	40	5	7
Lincoln Red	162	46	6	4	152	43	6	10	148	39	1	7
Shorthorn												
Red Poll	1	40	0	0	2	38	7	6	2	38	7	0
Shorthorn	795	46	11	4	757	43	4	0	763	42	0	0
South Devon	9	52	17	3	11	51	6	7	13	43	15	0
Sussex	7	34	16	3	8	36	15	3	8	34	14	3
Welsh Black	69	32	15	5	72	30	5	4	73	27	18	6
All Breeds	1,454	46	6	5	1,421	43	1	9	1,452*	41	6	7

* 1,469 bulls were located, but grants in respect of 17 were in suspense at the end of the year.

the general standard of the bulls provided under the Scheme has been maintained.

It will be seen from the Table II (above) that Shorthorns account for rather more than half the bulls located under the Scheme, and that the other breeds provided in appreciable numbers are Devons, Herefords, Lincoln Red Shorthorns, and Welsh Blacks, which predominate in the homes of these breeds. Most of the Shorthorn bulls located are of dairy strain, 513 being dairy, 160 beef and 90 dual purpose bulls.

Service Fees.—The service fees charged for the use of the premium bulls in the past three years have been as follows:—

Year	2/6	3/-	3/6	3/9	4/-	4/6	5/-	5/6	6/-
1931-32	71	57	45	—	128	13	846	12	119
1932-33	76	54	59	—	129	16	830	8	108
1933-34	78	51	56	1	146	14	854	9	108
Year.	6/6	7/-	7/6	8/-	8/6	9/-	9/6	10/-	10/6
1931-32	12	4	130	6	2	—	—	8	1
1932-33	13	3	110	6	1	—	—	7	1
1933-34	14	3	104	5	—	—	—	9	—

There is naturally very little change in the general level of service fees charged from year to year, but, for some years, there has been a gradual tendency towards reduced fees. In 1933-34 the number of service fees above 5s.

LIVE STOCK IMPROVEMENT REPORT

declined from 257 to 252 while those under 5s. increased from 334 to 346.

Premium Boars.—The applications for premiums for boars increased considerably during 1933-34, and the number of subsidized boars at the end of March, 1934, was 1,007, or 34 more than a year earlier.

TABLE III.
NUMBER OF BOARS SUBSIDIZED EACH YEAR SINCE THE COMMENCEMENT OF THE SCHEME.

<i>Year (April 1- March 31).</i>	<i>No. of Boars.</i>	<i>Year (April 1- March 31).</i>	<i>No. of Boars.</i>
1914-15 ..	115	1924-25 ..	655
1915-16 ..	193	1925-26 ..	710
1916-17 ..	216	1926-27 ..	844
1917-18 ..	264	1927-28 ..	907
1918-19 ..	350	1928-29 ..	933
1919-20 ..	399	1929-30 ..	972
1920-21 ..	441	1930-31 ..	1,047
1921-22 ..	550	1931-32 ..	1,024
1922-23 ..	569	1932-33 ..	973
1923-24 ..	638	1933-34 ..	1,007

The average number of services per boar in service years expiring in 1933-34 was 57, and the total number of sows served by the premium boars was 54,257 belonging to 22,929 persons.

The pig-breeding industry has been influenced very considerably by the operations of the Pigs and Bacon Marketing Boards. The rise in prices of both bacon and pork pigs, which took place when the imports of pig products were controlled in view of the contracts made by home producers under the Pigs Marketing Scheme, together with the greater stability of prices which the Board is expected to secure, have led to increased interest in pig breeding on the part of farmers. As regards improvement in the quality of the pigs kept in the country the grading of the pigs sent to the bacon factories and payment for them according to grade has been of great importance. Reports received from the Live Stock Officers show that breeders are much more anxious than formerly to produce the best type of pig required by the bacon factories, and more attention is being given to the class of animals used for breeding. As a result the pigs kept in most parts of the country are already tending towards a definite type.

The operations of the Ministry's premium boar scheme over past years have been of considerable value in connexion with the present effort to improve the type of pig in the country, as in those districts where premium boars

LIVE STOCK IMPROVEMENT REPORT

have been in use even for comparatively short periods, numbers of pigs were available for breeding purposes which conformed very closely to the required standards. Pigs sired by premium boars have graded well, and special reference may be made to the fact that recently two complete consignments of pigs sired by a premium Large White boar were placed in Grade A at the bacon factory. As in previous years, many instances could be quoted of pigs sired by premium boars securing first prizes at Christmas sales. At a recent sale in Berkshire a Large White boar sired by a premium boar was sold for 105 guineas and 10 gilts by the same boar averaged 13½ guineas, while 33 gilts by another premium Large White boar averaged 16 guineas, at the same sale.

Breeds and Prices.—The desire to breed pigs of the type required by the bacon factories has accelerated the movement that has been going on for some years, towards a greater use of the Large White boar, and during the past year the Ministry has had a large number of applications from the owners and users of premium boars for the breed of boar to be changed to Large White. The number of premium boars of the Large White breed increased from 802 on March 31, 1933, to 903 a year later, and boars of this breed accounted for over 90 per cent. of the total number of subsidized boars at March 31, 1934, as compared with 84 per cent. a year earlier and only 64 per cent. five years ago.

The average price of the boars provided under the Scheme in 1933-34 was slightly less than in the previous year, and the Large Whites located averaged £10 9s. *od.* per head against £10 14s. *od.* in 1932-33 (see Table IV).

Service Fees.—As with bulls, there is little change from year to year in the general level of service fees charged for the use of the premium boars. Over 70 per cent. of the boars serve at a fee of 5s., and only about 13 per cent. at more than 5s. The following table shows the trend of service fees during the last three years:—

<i>Year.</i>		2/6	3/-	3/6	4/-	4/6	5/-
1931-32	..	3	10	26	75	8	725
1932-33	..	3	10	21	84	5	705
1933-34	..	4	10	18	91	6	733
<i>Year.</i>		5/6	6/-	6/6	7/-	7/6	10/-
1931-32	..	1	75	3	3	65	6
1932-33	..	2	60	3	2	55	4
1933-34	..	2	70	3	2	52	3

LIVE STOCK IMPROVEMENT REPORT

TABLE IV.

NUMBER AND AVERAGE PRICES OF BOARS OF EACH BREED.

BREED	1931-32			1932-33			1933-34					
	No.	Average price			No.	Average price			No.	Average price		
		£	s.	d.		£	s.	d.		£	s.	d.
Berkshire ...	18	11	7	1	10	10	6	1	6	9	1	6
Cumberland ...	39	12	1	6	23	10	9	11	11	9	4	5
Essex ...	—	—			2	9	4	0	2	9	9	0
Gloucester												
Old Spots	2	15	5	0	2	15	5	0	1	10	10	0
Large Black ...	33	11	1	8	22	10	8	8	8	12	1	3
Large White ...	769	12	12	4	802	10	13	11	903	10	9	1
Large White Ulster	3	15	0	0	1	12	0	0	—	—		
Lincoln												
Curly Coated	17	9	19	1	8	7	14	3	5	6	10	10
Long White												
Lop-Eared	42	12	12	10	29	11	15	4	16	11	18	6
Middle White ...	59	12	10	6	35	11	7	7	20	9	8	1
Wessex Saddleback	10	11	10	11	7	10	11	5	2	8	18	6
Welsh ...	8	13	2	5	13	10	17	0	20	11	16	8
All Breeds ..	1,000	12	9	7	954	10	14	5	994*	10	9	0

* 1,007 boars were located, but grants in respect of 13 were in suspense at the end of the year.

Premium Rams.—Thirty grants were awarded for Welsh Mountain rams in 1933-34 and the hiring fees paid ranged from £6 10s. 0d. to £12, £10 or over being paid in respect of 24 of the rams. For some years this scheme for the improvement of the sheep on the Welsh hills operated only in North Wales, but it was eventually extended to the whole of the country and full advantage is now being taken of it by breeders in South Wales. The scheme affords a useful demonstration of the possibility of improving mountain sheep by judicious selection of suitable rams to mate with hill flocks, and the classes for the progeny of these rams at shows prove very instructive. A ram sired by a premium ram out of a ewe sired by a premium ram won first prize at the Royal Show last year, while the Champion ram at the Aberystwyth sale was hired by a subsidized Society.

Horse Breeding.—*Heavy Horse Societies.*—The grants paid to Heavy Horse Societies for encouraging the improvement of heavy horses by the provision of high-class pedigree stallions at moderate service fees have very considerable

LIVE STOCK IMPROVEMENT REPORT

influence on the heavy horse breeding industry of the country. The number of 1933 foals that were sired by subsidized stallions was 8,371, or about 30 per cent. of the total number of heavy foals returned as on agricultural holdings on June 4, 1933. The Societies take great care in selecting suitable stallions, and the provision of good-class stallions encourages the mating of the best mares. Part of the grants paid to Societies is devoted exclusively to the award of assisted nominations to small farmers, and the use of the subsidized stallions at the very low fees that these grants make possible is much appreciated. At local shows the progeny of the stallions hired by these Societies frequently take most of the prizes, and the improvement in the general standard of the heavy horses bred in those districts where Societies have been in operation for some years is marked. The Champion gelding at last year's Shire Horse Show and the winning progeny group at that Show for two years in succession were sired by stallions which had been travelled by subsidized Societies.

As a result of the small number of heavy horses that were bred four or five years ago, the supply of geldings is now comparatively low and there has been a keen demand, at advanced prices, for those offered for sale. These conditions have encouraged an increase in breeding, and some

TABLE V. HEAVY HORSE SCHEME.

<i>Service Season.</i>	<i>No of Stallions.</i>	<i>Total No. of Mares served.</i>	<i>Average No. of Mares served.</i>	<i>No. of Assisted Nominations.</i>	<i>Average Hiring Fee of Stallions.</i>	<i>Average Service Fee.</i>
					£	£ s. d.
1914 ..	72	6,365	68	1,503	231	2 8 6
1915 ..	97	9,122	94	2,430	241	2 9 6
1916 ..	108	9,995	92	2,181	244	2 11 0
1917 ..	110	10,556	96	2,151	258	2 16 3
1918 ..	122	12,281	100	2,165	285	2 15 8
1919 ..	118	10,920	96	1,996	317	3 6 3
1920 ..	105	9,133	87	1,839	345	3 13 1
1921 ..	101	7,888	78	1,943	333	3 13 7
1924 ..	87	6,098	70	*	178	2 7 0
1925 ..	96	7,413	77	1,723	194	2 8 4
1926 ..	98	8,165	83	2,171	208	2 8 6
1927 ..	105	8,950	85	2,599	211	2 8 9
1928 ..	114	9,792	86	2,805	217	2 9 4
1929 ..	120	10,196	85	3,052	221	2 9 9
1930 ..	140	12,248	87	3,604	239	2 11 1
1931 ..	159	14,226	89	4,266	235	2 10 2
1932 ..	162	14,624	90	3,945	226	2 9 9
1933 ..	165	15,655	95	4,280	220	2 10 8

* No grant was made by the Ministry for assisted nominations (except to the Cumberland and Westmorland Society) for the service season 1924.

LIVE STOCK IMPROVEMENT REPORT

of the subsidized Societies have again found it necessary to hire additional stallions, while the average number of mares served per stallion advanced sharply in 1933.

The above figures (Table V) do not include those relating to the Cumberland and Westmorland Society, which issues assisted nominations to selected stallions travelled by their owners in these counties. The number of such nominations issued by this Society in each year since its formation in 1915 has been as follows:—

<i>Service Season.</i>	<i>No. of Assisted Nominations.</i>	<i>Service Season.</i>	<i>No. of Assisted Nominations.</i>
1915	.. 385	1926	.. 220
1916	.. 394	1927	.. 247
1917	.. 328	1928	.. 281
1918	.. 321	1929	.. 283
1919	.. 264	1930	.. 269
1920	.. 254	1931	.. 290
1921	.. 255	1932	.. 198
1924	.. 121	1933	.. 217
1925	.. 197		

In 1933, grants were paid for 165 stallions hired by Societies, an increase of 3 as compared with 1932, while the average number of mares served by these stallions was 95, an increase of 5 over the previous year and 10 more than in 1929. The total number of mares served, including those in respect of which assisted nominations were issued by the Cumberland and Westmorland Society, was 15,872 against 14,822 in 1932, while the number of assisted nominations to small farmers increased from 4,143 to 4,497. The average hiring fee of the stallions was slightly lower and the average service fee rather higher than in the previous year; these facts may be attributed to the effect of the reduction in the grants in 1932 as a result of the pressing need for economy in Government expenditure. The subsidized stallions consisted of 128 Shires, 22 Clydesdales and 15 Suffolks, this being an increase of 2 Clydesdales and 1 Suffolk as compared with 1932.

The services of the subsidized stallions that were travelled in 1932 resulted in 58.5 per cent. of the mares served producing foals, which compared with 59 per cent. in 1931 and 58.2 per cent. in 1930.

Licensing of Stallions.—There was again in 1933 a small increase in the number of stallions licensed under the Horse Breeding Act, 1918, the total number licensed being 1,516

LIVE STOCK IMPROVEMENT REPORT

against 1,477 in 1932. Licences were refused in respect of 40 stallions, or 5 less than in 1932.

TABLE VI. LICENSING OF STALLIONS.

<i>Year (ending October 31).</i>	<i>No. of applications for Licences.</i>	<i>No. of Licences issued.</i>	<i>No. of refusals.</i>
1920 ..	4,153	3,749	404
1921 ..	4,060	3,816	244
1922 ..	3,644	3,479	165
1923 ..	2,897	2,761	136
1924 ..	2,285	2,210	75
1925 ..	1,908	1,849	59
1926 ..	1,664	1,608	56
1927 ..	1,574	1,537	37
1928 ..	1,454	1,414	40
1929 ..	1,472	1,436	36
1930 ..	1,472	1,430	42
1931 ..	1,470	1,432	38
1932 ..	1,522	1,477	45
1933 ..	1,556	1,516	40

Heavy stallions were largely responsible for the increase in the total number of licences issued, light stallions declining from 215 to only 180. Of the heavy stallions licensed, 888 were Shires, an increase of 25; 154 were Suffolks, an increase of 18; 138 were Clydesdales, an increase of 8; and 57 were Percherons, the same number as in 1932. Although light stallions showed a decrease, the number of pony stallions licensed advanced from 51 in 1932 to 61 in 1933. Thoroughbreds numbered only 134 against 166 in the previous year.

TABLE VII.

NUMBERS OF LICENCES GRANTED UNDER THE HORSE BREEDING ACT,
1918, IN ENGLAND AND WALES, 1932 AND 1933.

BREED OR TYPE	PEDIGREE (i.e. Stallions entered or accepted for entry in the recognized Stud Book of their Breed)		NON-PEDIGREE (i.e. Stallions not entered or accepted for entry in a recognized Stud Book)		TOTALS OF EACH BREED AND TYPE (Pedigree and Non-Pedigree)	
	1932	1933	1932	1933	1932	1933
Heavy						
Shire ..	781	789	72	99	853	888
Clydesdale ...	114	121	16	17	130	138
Suffolk ...	134	147	2	7	136	154
Percheron ...	54	56	3	1	57	57
Others ...	—	—	35	38	35	38
Total Heavy Horses	1,083	1,113	128	162	1,211	1,275

LIVE STOCK IMPROVEMENT REPORT

	1932	1933	1932	1933	1932	1933
Light						
Hackney ..	20	17	4	5	24	22
Thoroughbred	163	131	3	3	166	134
Arab ...	5	9	3	3	8	12
Others ...	7	6	10	6	17	12
Total Light Horses	195	163	20	17	215	180
Ponies & Cobs						
Welsh ...	7	10	—	—	7	10
Fell ...	1	3	—	—	1	3
Dales ...	8	7	3	5	11	12
Polo and Riding	8	9	—	3	8	12
Welsh Cob ...	14	12	5	8	19	20
Others ...	5	3	—	1	5	4
Total Ponies and Cobs	43	44	8	17	51	61
TOTALS ...	1,321	1 320	156	196	1,477	1,516

The number of stallions rejected for each of the prescribed diseases and defects was as follows:—

Whistling ..	14	Ringbone ..	2
Roaring ..	10	Inadequate	
Sidebone ..	5	Prolificacy	2
Cataract ..	3	Bone spavin ..	1
Shivering ..	2	Stringhalt ..	1

Appeals against refusals were lodged in 10 instances and 6 of these were successful. Of the 40 stallions rejected 38 were of heavy breeds or types.

During the service season reports were received of 17 infringements of the Act as compared with 19 during the preceding season. Successful proceedings were taken by the police in six instances where unlicensed stallions had been travelled for service. The other infringements reported were mostly in respect of the travelling or exhibition for service of licensed stallions unaccompanied by the licences, and in these instances the owners and leaders were warned as to the necessity for complying with the provisions of the Act in this respect.

Milk Recording.—The number of members of Milk Recording Societies showed a further decrease in 1932-33, but the reduction was smaller than in any of the previous

Livestock Improvement Report

five years and it is anticipated that next year's figures will show that the decline in official milk recording has ceased. The decrease in the membership of Milk Recording Societies has been shown in previous reports to be mainly due to the bad financial position of farmers. Most cow owners who give up recording officially, in order to keep down their expenses, continue to record privately, but reports indicate that the compelling influence of a Milk Recording Society is often needed if recording is to be carried out with the necessary regularity.

Table VIII gives comparative figures of the number of herds and cows recorded for each year since 1917-18, when all Societies were required to adopt a uniform milk-recording year, and it will be noticed that, although the number of herds recorded declined in 1932-33 by 84, the number of cows recorded was practically the same as in 1931-32:—

TABLE VIII.

<i>Year ended October 1.</i>	<i>Societies. Members.</i>		<i>Herds.</i>	<i>Cows.</i>
1917-18 .	27	639	708	19,793
1918-19 .	38	1,191	1,332	37,880
1919-20 .	46	2,075	2,312	61,323
1920-21 .	52	3,328	3,664	97,903
1921-22 ..	55	3,949	4,362	117,023
1922-23	55	4,365	4,767	127,151
1923-24	52	4,764	5,209	138,086
1924-25	50	5,081	5,516	148,905
1925-26	49	5,174	5,656	154,322
1926-27	51	5,166	5,650	156,847
1927-28	50	4,862	5,320	149,971
1928-29	50	4,616	5,065	144,812
1929-30	49	4,501	4,934	140,266
1930-31	49	4,412	4,836	137,866
1931-32	49	4,267	4,682	135,912
1932-33	49	4,187	4,598	135,902

Average Yield of Recorded Cows.—The milk yields of cows during the milk recording year, October 1, 1932, to October 1, 1933, were seriously affected by the shortage of grass in the summer of 1933 as a result of the prolonged drought. It is therefore not surprising to find the average yield of recorded cows less than in the previous year, though the decrease is smaller than might have been anticipated. The average yield was 700 gallons per cow recorded for the full year, as compared with 709 gallons in 1931-32 and with 719 gallons in 1930-31 which is the highest average yield ever obtained.

In spite of the general reduction in the average yield of milk, there were 15 Societies, most of which were on the

LIVE STOCK IMPROVEMENT REPORT

TABLE IX. AVERAGE YIELD OF RECORDED COWS.

Year Oct. 1 to Oct. 1	Particulars of all cows and heifers recorded.			Particulars of cows recorded for full year.			
	No. of cows and heifers.	Total yield.	Aver- age yield*	No. of cows.	Perce- tage of total cows and heifers.	Total yield.	Aver- age yield*
		Gal.	Gal.			Gal.	Gal.
1917-18	19,793	8,426,958	426	8,775	44	5,255,923	599
1918-19	37,880	16,204,941	450	17,989	47	10,543,516	579
1919-20	61,323	29,344,887	479	27,266	44	17,363,347	637
1920-21	97,903	48,512,380	495	48,248	49	30,892,620	640
1921-22	117,023	60,463,617	517	63,318	54	41,208,073	651
1922-23	127,151	67,904,224	534	68,349	54	46,956,565	687
1923-24	138,086	73,963,165	535	73,338	53	50,299,884	685
1924-25	148,905	76,419,498	513	77,132	51	51,695,291	670
1925-26	154,322	81,623,788	529	81,669	53	56,102,434	687
1926-27	156,847	82,161,809	524	81,749	52	55,677,261	681
1927-28	149,971	76,896,131	513	77,171	51	51,931,633	673
1928-29	144,812	75,948,485	524	74,171	51	51,207,594	690
1929-30	140,266	75,293,001	537	71,432	51	50,766,464	711
1930-31	137,866	75,357,035	547	71,480	52	51,386,105	719
1931-32	135,912	73,793,049	543	70,826	52	50,243,265	709
1932-33	135,902	73,422,655	540	73,328	54	51,300,933	700

* Before 1924-25 the average yield was calculated at the equivalent of 10½ lb. to a gallon, and subsequently at 10¼ lb.

western side of England or in Wales, which secured increased average yields as compared with 1931-32. The Society with the highest average yield in 1932-33 was Norfolk with 8,223 lb. (796 gallons), followed by the Derby and District Society with 8,148 lb. (789 gallons), and the Essex County Society with 8,025 lb. (777 gallons). Ten Societies had average yields between 7,500 lb. (726 gallons) and 8,000 lb. (774 gallons) and 17 secured average yields of between 7,000 lb. (677 gallons) and 7,500 lb. (726 gallons).

Individual herds with average yields for full-year cows of 8,000 lb. (774 gallons) or over numbered 1,191, as compared with 1,278 in 1931-32. There were 241 herds with average yields of 10,000 lb. (968 gallons) or over, against 253 herds in the previous year, while there were 14 herds with average yields of over 13,000 lb. (1,258 gallons), the highest herd average of the year being 15,618 lb. (1,511 gallons). In Table X are given a few examples of the increases in the average yields of herds after a few years of recording, together with approximate estimates of the cash values of

LIVE STOCK IMPROVEMENT REPORT

the increased yields secured. These examples indicate the improvement in the returns that may be obtained from dairy herds by reason of the fact that milk recording stimulates interest in the selection, breeding and management of cows.

TABLE X.

Herd.	No. of years during which records have been taken.	Average yield per cow in first year.	Average yield per cow in last year.	Increase in annual average yield per cow.	No. of full-year cows in last year of period.	Cash value of increase of last year over first year at 1s. per gallon.	
						Per cow.	Per herd.
		Gal.	Gal.	Gal.		£ s.	£ s.
A (Pedigree Friesian)	5	767	1,141	374	26	18 14	486 4
B (Pedigree Jersey)	5	573	980	407	17	20 7	345 19
C (Pedigree Red Poll)	7	483	747	264	21	13 4	277 4
D (Non-Pedigree Short-horn)	5	601	930	329	13	16 9	213 17
E (Non-Pedigree Guernsey)	5	588	880	292	11	14 12	160 12

The standard yield of their breed or type was reached by 16,764 cows as compared with 17,241 in 1931-32 (see Table XI). The number of cows that gave over 20,000 lb. of milk in 1932-33 was 63, an increase of 22 as compared with the previous year, while 10,109 gave over 10,000 lb. of milk in the year against 10,423 in 1931-32. The highest yield recorded during the year was 27,465 lb. (2,658 gallons), which was given by a Friesian cow recorded by the Suffolk Society.

The number and average yield of cows of certain breeds recorded in 1932-33 are given in Table XII. As compared with 1931-32 there were increases in the numbers of Ayrshire, Guernsey, Jersey and Red Poll cows recorded, the numbers of Friesians and Devons were practically unchanged, and other breeds showed decreases. Shorthorns accounted for 57 per cent. of the total number of cows recorded; Friesians, 16½ per cent.; Guernseys, 8½ per cent.; Jerseys, 4¾ per cent.; and Red Polls, 4½ per cent. Every breed, except Devon and Welsh Black, shared in

LIVE STOCK IMPROVEMENT REPORT

TABLE XI.

NUMBER OF COWS THAT GAVE THE STANDARD YIELD PRESCRIBED FOR THEIR BREED OR TYPE DURING THE YEAR ENDED OCTOBER 1, 1933, CLASSIFIED ACCORDING TO BREED AND YIELD.

Breed or type.	Stand- ard yield lb.	Yields (in lb.).							
		8,000 to 9,000	9,000 to 10,000	10,000 to 11,000	11,000 to 12,000	12,000 to 14,000	14,000 to 16,000	16,000 to 20,000	Over 20,000
Ayrshire ...	9,000	—	263	122	73	48	10	4	—
Blue Albion ...	9,000	—	25	19	11	12	1	—	—
Devon ...	8,000	41	20	7	2	2	—	—	—
Friesian ...	10,000	—	—	1,587	1,092	1,223	398	204	48
Guernsey ...	8,000	737	348	176	72	50	8	1	1
Jersey ...	8,000	356	172	95	29	31	—	2	—
Lincoln Red	9,000	—	110	89	37	29	7	1	—
Short-horn									
Red Poll ...	9,000	—	362	225	97	80	19	6	—
Shorthorn ...	9,000	—	3,905	2,114	1,041	720	152	49	13
South Devon ...	8,000	125	64	37	18	10	2	—	1
Welsh Black ...	8,000	30	10	9	3	2	1	—	—
Other Breeds ...	8,000	*64	23	6	8	5	—	—	—
TOTALS	—	*1,353	5,302	4,486	2,483	2,212	598	267	63

* Includes 11 Dexter cows with yields of 7,000 to 8,000 lb. (standard yield for Dexters is 7,000 lb.).

the general reduction in the average yield of milk per cow. The average yield of Shorthorns was reduced by 110 lb., while that of Friesians was 73 lb. less, Guernseys 81 lb. less, Jerseys 26 lb. less and Red Polls 99 lb. less than in 1931-32.

Issue of Certificates.—The number of Certificates of Merit shows a further increase this year, 641 such certificates being issued in respect of the three years ended October 1, 1933, as compared with 515 for the previous three-year period. In addition 39 Certificates of Merit were issued during the year in respect of three-year periods earlier than that ended October 1, 1933. Certificates of Merit are awarded for cows that have given during a three-year period the prescribed yield of milk for their breed or type and have been shown to be regular breeders, but they are only issued on the application of the owners of the cows and on payment of a fee of 5s. per certificate. The number of members of Societies who obtained Certificates of Merit was 201, an increase of 9 over the previous year. The numbers of certi-

LIVE STOCK IMPROVEMENT REPORT

TABLE XII.

Breed or type.	Total number of cows and heifers recorded.	Particulars of cows recorded for full year.			
		Number.	Percentage of total of cows and heifers.	Total yield	Average yield.
				lb	lb.
Ayrshire ...	4,114	2,172	52.7	15,716,016	7,236
Blue Albion ...	454	272	59.9	2,009,063	7,386
Devon ...	1,060	606	57.1	3,590,261	5,925
Friesian ...	22,335	12,886	57.6	113,752,527	8,828
Guernsey ...	11,105	5,341	48.0	34,466,044	6,453
Jersey ...	6,521	3,123	47.8	19,695,231	6,307
Kerry ...	524	274	52.2	1,523,345	5,560
Lincoln Red ..	2,097	1,085	51.7	7,863,565	7,248
Red Poll ..	5,924	3,723	62.8	26,715,416	7,176
Shorthorn ..	77,525	41,670	53.7	291,212,538	6,989
South Devon	2,246	1,076	47.9	6,908,184	6,420
Welsh Black ...	780	466	59.7	2,596,347	5,572

ificates issued in respect of the three-year period ended October 1, 1933, were, for Friesian cows 212, for Shorthorns 149, Red Polls 88, Guernseys 80 and Jerseys 57. The highest yields certified for the three-year period for the various breeds were—Friesian, 65,985 lb.; Shorthorn, 60,247 lb.; Red Poll, 52,991 lb.; Ayrshire, 52,152 lb.; Guernsey, 49,388 lb.; and Jersey, 39,979 lb.

Register of Dairy Cattle.—Volume XVII of the Register of Dairy Cattle, which was published in June, 1934, contains particulars of the 680 cows in respect of which Certificates of Merit were issued since the publication of the previous volume, and of 12 pedigree dairy bulls whose dams and sires' dams had given the prescribed yield of milk of their breed.

Calf and Bull Marking.—More advantage was taken in 1932-33 of the Ministry's scheme for the earmarking and registration of calves of milk-recorded cows, and 14,687 calves were marked as compared with 14,379 in 1931-32. Nearly 1,000 calves were marked by each of the Somerset and North Dorset, Berkshire, and Hampshire Societies, although the Scheme was more widely applied, in proportion to the number of recorded cows, in the Carmarthen, South Devon, Kendal and South Westmorland, and Cumberland and North Westmorland Societies, where the numbers of calves marked expressed as percentages of the

LIVE STOCK IMPROVEMENT REPORT

cows recorded were 36, 35, 34 and 19. Most of the calves marked were again heifer calves, less than 1,200 being bull calves. The number of bulls being used for service that were earmarked and registered by Societies for their members was 36.

Testing for Butter-fat.—The number of samples taken by Recorders for testing for butter-fat was appreciably larger than in 1931-32, affording evidence that members of Milk Recording Societies are giving greater attention to the quality of the milk yielded by their cows. In 1932-33 the samples taken numbered 170,335 against 154,407 in the previous year, and of these about 144,000 samples were from the milk of individual cows, the remainder being bulk samples from the milk of the whole herd. A comparison of the number of cows recorded by the individual Societies with the number of butter-fat samples taken shows that in Cornwall, Northumberland and Yorkshire relatively more testing was done than in other parts of the country.

The Ministry's Regulations for a uniform system of testing for butter-fat by Milk Recording Societies, to which reference was made in last year's Report, were not in force in the year under review. It may be mentioned, however, that the scheme has now been adopted by about 25 per cent. of the members of Milk Recording Societies and appears to be working smoothly.

Rationing.—Reports received from Live Stock Officers indicate that most members of Milk Recording Societies give close attention to the rationing of their cows according to the yield of milk, and that good use is made by them of the advisory services that are available. Advice is generally sought from the County Agricultural Organizers, and their assistance is much appreciated by the members who obtain their help in dealing with feeding problems.

Cost of Milk Recording.—There was no change in the average cost of milk recording in 1932-33 as compared with the previous year; the amount required by Societies from their members averaged 4s. 2d. per cow and the Ministry's grants averaged 2s. per cow.

NOTE.—Detailed information concerning the Ministry's Live Stock Improvement Scheme is given in the following memoranda, copies of which may be obtained (single copies free of charge) on application to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1:—

Form No. A 763/T.L. Scheme for the Improvement of Live Stock.
Form No. 609/T.L. Bull Grant Regulations.

LIVE STOCK IMPROVEMENT REPORT

Form No. 466/T.L. Boar Grant Regulations.
 Form No. 89/T.L. Heavy Horse Regulations.
 Form No. 392/T.L. Milk Recording Regulations (including the
 Butter-fat Testing Regulations, which are
 printed as a separate pamphlet).
 Form No. A 899/T.L. Guide to the Licensing of Bulls in England
 and Wales.

TABLE XIII. MILK-RECORDING SOCIETIES.

STATEMENT GIVING PARTICULARS OF THE 49 MILK-RECORDING
 SOCIETIES OPERATING DURING THE YEAR ENDED OCTOBER 1,
 1933.

(The Societies are arranged in order of total numbers of cows recorded.)

Society.	*No. of mem- bers.	*No. of herds.	Total No. of cows re- corded.	No. of cows re- corded for full year.	Average yield of cows re- corded for full year
					lb.
Suffolk	285	328	8,997	5,316	7,866
Essex County	183	216	8,785	4,837	8,025
East Sussex	234	267	7,744	4,029	6,759
Hampshire	181	213	7,168	3,972	6,779
Berkshire	168	198	6,961	3,856	6,971
Somerset and North Dorset	175	203	6,426	3,953	6,775
Norfolk	202	221	6,391	3,839	8,223
Hertfordshire County	168	186	5,483	2,949	7,222
Kent	125	145	4,295	2,195	6,968
West Sussex	121	133	4,244	2,265	7,355
Surrey	135	142	4,235	2,090	7,100
North Wilts	83	96	3,972	2,326	6,492
Lancashire County	111	118	3,785	1,516	7,771
Gloucestershire	106	113	3,338	1,756	7,358
Oxfordshire	89	97	3,224	1,781	7,125
Leicestershire and Rutland	96	102	2,949	1,441	6,874
Buckinghamshire	95	103	2,866	1,452	7,080
Dorset	49	68	2,831	1,743	6,741
Yorkshire	98	101	2,827	1,137	7,772
Warwickshire	98	101	2,645	1,365	7,238
Shropshire	63	65	2,398	1,258	6,995
South Devon and District	102	105	2,296	1,092	6,387
Staffordshire	63	65	2,242	1,124	7,574
Cambridgeshire and District	75	84	2,239	1,255	7,579
South Wilts	30	43	2,016	1,322	7,298
Northamptonshire	64	69	1,969	984	6,957
Nottinghamshire	49	51	1,877	839	7,348
Bristol and North Somerset	67	72	1,775	1,099	6,829
Cumberland and N. Westmorland	83	84	1,772	761	6,128
Cheshire County	42	46	1,651	801	7,215
Worcestershire	68	69	1,635	879	7,117
Bedfordshire	49	51	1,555	851	7,712
Derby and District	44	44	1,345	677	8,148
Lincolnshire	38	41	1,299	677	7,338
Durham County	47	49	1,287	632	7,291
Peak (Derby)	48	49	1,176	545	7,518
Northumberland	40	45	1,128	627	7,701
East Devon	58	58	993	634	6,683
Cornwall	46	46	788	457	6,314
Monmouthshire and Brecon	36	36	761	403	7,515

LIVE STOCK IMPROVEMENT REPORT

Society.	*No. of mem- bers.	*No. of herds.	Total No. of cows re- corded.	No. of cows re- corded for full year.	Average yield of cows re- corded for full year, lb.
Campden, Moreton and Dist. (Glos.)	33	33	760	415	6,888
Anglesey and Caernarvonshire ..	48	48	689	416	5,347
Kendal and South Westmorland ..	31	32	680	286	6,034
Denbighshire and Flintshire ..	27	27	572	350	7,158
Herefordshire	23	23	492	322	7,468
Carmarthenshire	15	16	427	240	7,275
Glamorganshire.. ..	22	22	387	212	7,822
Cardiganshire	22	22	297	177	6,281
Pembrokeshire	16	16	230	175	7,040
Totals	4,151	4,562	135,902	73,328	7,229

* Herds of goats are not included.

SOME IMPRESSIONS OF BRITISH FARMING

VI—CONCLUDING IMPRESSIONS.

J. A. SCOTT WATSON, M.A.,
*Sibthorpe Professor of Rural Economy, University
of Oxford.*

It is obvious to any close observer that our agriculture is passing through a period of rapid change. In some districts the style of farming that was typical twenty years ago is now hardly to be found; in others various experiments in farm reorganization are being made—without, however, as yet, any clear conclusions having been reached upon the broad questions of future policy; in still other instances such changes as have been made are regarded, by those responsible for them, as mere temporary expedients, designed to tide over the time until the return of some measure of stability in prices. Lastly, there are a good many farmers who have dropped the old idea of working to any hard-and-fast system, and are prepared to move from year to year in any direction that seems to offer the hope of a temporary profit. It is difficult to single out the new things that are likely to endure, or to speak with confidence about general trends: but something of the sort must be attempted at the conclusion of any survey of contemporary farming.

***Intensification and Extensification.**—It seems a little paradoxical that, at one and the same time, we should be watching the spread of both the most and the least intensive systems of farming. On the one hand, for instance, a good deal of old grass land in Lincolnshire is being broken up in order that it may grow potatoes, sugar-beet, vegetables and fruit; while on the other, in Hampshire and Wiltshire "Prairie farming" and "Ranching" methods are spreading at the expense of the old rather intensive system of arable farming. In extreme cases anything that may be called farming is being given up.

The latter processes, naturally, are those that attract the more attention. The decline of employment and the apparent waste of land are obvious and regrettable things that seem to imply the defeat of the present generation of farmers and the decay of the industry. There is, among townspeople, a very general tendency to regard these things as

IMPRESSIONS OF BRITISH FARMING—VI

proof of the inefficiency of the farmer. If land is fallow when it might be growing roots, or is under indifferent grass when it might be bearing corn, it is obvious that neither the maximum possible output of food, nor the maximum possible amount of employment, is being provided—and these are still regarded, by many, as the only objects to be aimed at in farming. The commonest of all questions to be asked after a lecture to townsmen, on any agricultural topic, is whether the present generation of British farmers is making the best use of the land. The questioner generally has the idea that a truly efficient body of farmers would not only maintain existing farms at the highest level of productivity but would also convert our mountain-sides and heaths into well-tilled fields.

It is a little curious that this kind of view is held only in relation to agriculture. For instance, one of the commonest sights of the countryside is that of the water-mills in various stages of decay. Here we see a potentially valuable natural resource—water power—once harnessed and now running to waste; a considerable capital investment, in the form of buildings and machinery, lying unproductive and perhaps forming a very harmful obstruction to the drainage of the area; a place too where formerly several men may have been busily and usefully employed, but now providing no employment whatever. Yet nobody, because of these things, imputes inefficiency to the milling industry. The derelict mill is accepted for what it is—an inevitable, if regrettable, consequence of technical progress. Yet the position with regard to much of our poor land is precisely parallel. At one time it was necessary to cultivate it in order to produce much-needed food, and it could be profitably cultivated because food was dear and labour cheap. Under the traditional system of farming, however, it will not now pay the modern wage, far less any rent or profit. The only economic alternatives are to abandon the land or to carry through a complete reorganization aimed at a drastic reduction of costs. Any such reorganization, if it is to succeed, must mean a large reduction of employment and possibly, too, a big reduction in output.

Perhaps the truest criticism of the British farmer is just the opposite of that most commonly made. He tends to farm too well. From pride in his craft he adheres to an unprofitably high standard in unessential things. From sentiment, or from humanitarian motives, he tends to keep

IMPRESSIONS OF BRITISH FARMING—VI

too many men rather than too few. He is reluctant to face any reorganization that will involve a lowering of production. The present requirements of the world, in the way of agricultural produce, can be more than met by the land already under cultivation, and any probable increase in demand will perhaps be more cheaply met by the use of more fertilizers rather than of more land or more labour.

Over against the instances where a decline in output has to be recorded are many others where the production per acre, or per unit of live stock, is increasing fast. These increases are being obtained, for the most part, not by means of additional labour but by the application of new-found knowledge. With the potato crop, for instance, the enhanced yields are due mainly to the use of improved varieties, to the control of blight and virus disease, and to the use of greatly increased dressings of artificial fertilizers. The improvement of our pastures, which is perhaps the most notable example of agricultural progress in the past generation, has been brought about by the discovery of improved strains of herbage plants, by the use of a waste product of the steel industry, and by the more skilful control of grazing. The improved yields of our dairy cows are due in part to increasing skill in breeding but much more to the better use of concentrated feeding stuffs. The rapid improvement in efficiency of the pig and poultry industries can be largely attributed to spread of knowledge of the proper balancing of rations. The great bulk of all this progress has been made possible by the expenditure of public money, by this and other countries, upon education and research; and there can be no doubt that the cost has been repaid to the community, many times over, in the form of cheaper and better food.

Expanding and Contracting Industries.—It is common knowledge that the demand for certain agricultural products has expanded in recent years while that for others has declined. In the first category are poultry and eggs, dairy produce, fruit and vegetables (both fresh and canned) and glasshouse products, including tomatoes, flowers, etc. Examples of products that are in declining consumption are oats, beef, and—in the more advanced countries—wheat and possibly potatoes. Productive processes in farming are relatively slow, and a change-over from one product to another usually involves the scrapping of some existing equipment, or the investment of fresh capital, or

IMPRESSIONS OF BRITISH FARMING—VI

both. Hence the intelligent anticipation of demand is essential to any scheme of planning, whether on the part of the individual farmer or on that of the industry as a whole. The supply of information on which to base anticipation of changes in demand, however, is very scanty. It is, indeed, a useful general principle that those things that the rich buy are also those that the poor would buy if they could, and will buy when they can. Since there is a general tendency towards higher standards of living we must expect, in the long run, an increasing demand for the more attractive and costly forms of food, and a diminishing demand for the plainer and cheaper types. On this principle some of the demand changes of recent years could have been and were predicted, e.g., expansion in the case of poultry and eggs and fruit, and contraction in the case of oats. Other changes have been quite unexpected. Thus an increased demand for beef might have been expected to follow a rise in real wages, because the wealthier classes have always consumed more beef than the poorer: but the substitution of poultry and other foods for beef seems to have proceeded so rapidly that there has been an actual decline in beef consumption.

In certain instances whole groups of farmers have been able to change over rapidly from one type of production to another. Thus, twenty years ago the Cotswold area was concerned chiefly with corn, sheep and the rearing of store cattle, while dairying was quite exceptional. Nowadays milk cans are to be seen at nearly every road-end. In other areas it has been difficult to find any alternatives to the existing industries, e.g., to oat-growing and beef production in the north of Scotland, to summer fattening of cattle in the Leicestershire grazing area, or to the traditional corn-and-sheep farming on the Lincoln Heath and the Yorkshire Wolds. It would almost seem that, in addition to receiving at least temporary financial help, these depressed areas should be subjected to an intensive campaign of farm management research, aimed at the discovery of alternative and more profitable types of production.

Mechanization and Economy of Labour.—Perhaps the most consistent trend in post-war farm management has been in the direction of increasing the net output per man employed, and the success or failure of many farms can be explained largely according to the extent of the increase that has been found possible. The result aimed at can of

IMPRESSIONS OF BRITISH FARMING—VI

course be achieved in different ways. In certain instances the farmer has made a large reduction in his labour staff without a correspondingly large loss of output. In other cases the old labour strength has been retained while the output has been raised by the addition of poultry or pig departments, the substitution of dairy cows for other stock, the cultivation of beet or vegetables in place of roots, and so on.

Among the new ideas in labour organization is that of planning each enterprise to fit the man rather than the land or the buildings. The use of the word *unit*, which has become so common, especially in connexion with poultry, pig and dairy enterprises, is much more than a mere verbal fashion. It expresses the idea of an enterprise of exactly the size required to provide whole-time employment for a skilled specialist, with the optimum amount of unskilled or partially-skilled labour under his control. This has the advantages of greater efficiency of the labour staff and of permitting the delegation of a good deal of the work of management. The working out of the idea frequently necessitates the provision of new equipment but the advantages are often sufficient to meet, with a margin, the additional capital charges.

Another aspect of the same trend is to be seen in the rapidly-increasing use of labour-saving machinery. With certain crops the amount of manual labour has been cut down to a negligible amount. The most complete example is mechanized corn growing, where the manual labour has been reduced to that of emptying the sacks of seed and manure into the drills and loading up the corn for market. The use of side rakes, sweeps and stackers has made possible almost the same result with haymaking, and a comparable economy of labour has been achieved in the modern bail system of milk production. Where particular crops or types of stock have not yielded to labour-saving devices, they are tending to be replaced by others. Thus the area of roots is declining rapidly and farmers are relying more and more upon hay and concentrates for winter feeding. For similar reasons the "arable" breeds of sheep are being replaced by grassland types.

It is a matter for regret to many people that all this progress in agricultural technique is driving men off the land—but it must be insisted that the chief result of agricultural progress has always been, and must always be, to

IMPRESSIONS OF BRITISH FARMING—VI

set free an increasing proportion of the population for work other than farming. Other benefits, indeed, such as shorter hours for the agricultural worker and a better quality and greater variety of food to the consumer, may also be gained; but these things are quite unlikely to balance the increase in efficiency of the farming industry. We need not look back very far, even in Europe, or abroad beyond countries like China, to find a condition of agriculture requiring that eight workers out of every ten be occupied in the business of food production. In the more advanced countries as a whole we have got to the stage when one worker out of every seven suffices. If we take England and Wales during the past sixty years, the net output of the agricultural industry has probably risen by a small amount,* while the number of agricultural workers has fallen from 962,000 in 1871 to 697,000 in 1932, or about 30 per cent. Meanwhile the total of real wages earned by the reduced number of workers has risen by probably more than 100 per cent.

The decline of the agricultural population has been a frequent cause of alarm in this country ever since the sixteenth century. Various measures have been taken by the State, at different times, to check the flow of workers out of agriculture and even to press people back on to the land. Of course the question of the desirable ratio of land workers to industrialists and traders is one of broad national policy and involves other than purely economic considerations. It can be said generally, however, that a result of all such measures has been to place agriculturists at a disadvantage, over against the industrial and trading classes, in the sharing of the national income. Any future schemes of land settlement, etc., must be closely examined with this point in mind.

* The gross output has risen very greatly but this is largely offset by a much heavier expenditure on fertilizers, feeding stuffs and machinery.

INTENSIVE TREATMENT OF A WILTSHIRE DOWN PASTURE :

EFFECT ON THE BOTANICAL COMPOSITION

L. G. G. WARNE, M.Sc.,

Department of Botany, University of Bristol.

Introduction —The purpose here is to describe changes that have occurred in the botanical composition of a Wiltshire Down pasture following the adoption of a certain system of cutting and manuring. The plots concerned were those laid down by the University of Bristol under the auspices of the Development Commissioners in 1929, and certain of the results of the trials have already been reported.^{13*}

Two plots were marked out in 1929, and their treatment since that date has been as follows:—

- 1929 Plot 1. No manure.
„ 2. Ground chalk at the rate of 5 tons per acre.
Superphosphate at the rate of 10 cwt per acre.
Sulphate of potash at the rate of 2 cwt. per acre applied early in the year,
and Ammonium sulphate at the rate of $\frac{1}{2}$ cwt. per acre applied late in February.
Cuts were taken from both plots at three-weekly intervals, and Plot 2 received, after each cut, a dressing of ammonium sulphate equivalent to $\frac{1}{2}$ cwt. per acre.
- 1930 Plot 1. No manure.
„ 2. Ammonium sulphate at the rate of $\frac{1}{2}$ cwt. per acre late in February.
Three-weekly cuts were taken and, after each cut, Plot 2 received a dressing of ammonium sulphate at the rate of $\frac{1}{2}$ cwt. per acre.
- 1931 Both plots were treated as in 1930.

At this stage, the trials by the Development Commissioners were concluded, but the treatments were continued during 1932 by the Department of Agriculture, University of Bristol. Notes on the herbage of the two plots, taken during preceding years, suggested that a botanical analysis of the two plots was desirable.

It is realized that the small size of the plots and the fact that they were not duplicated, and were mown instead of grazed, necessitate caution in interpreting the data that will be presented. As will be seen, however, certain of the differences between the two plots are of such magnitude as to be of interest.

* For references, see p. 474.

INTENSIVE TREATMENT OF A WILTSHIRE DOWN PASTURE

The pasture is of the Wiltshire Down type, occupying a thin soil, overlying a chalk formation, and situated at Overton, a few miles west of Marlborough. Sheep's Fescue (*Festuca ovina et var.*) occupies a dominant position amongst the grasses. The pasture is of the type described by Smith & Crampton⁸ as "... a stable type, consisting chiefly of wiry grasses of the Sheep's Fescue type, along with scattered large-rooted, procumbent acauline rosette plants or training small-leaved herbs."

An analysis of the untreated pasture has previously been conducted by Davies¹³, but, since the present writer used the Armstrong grid method², the results obtained are not strictly comparable with those of Davies. A cursory examination of the pasture and of the experimental plots revealed the presence of a considerable number of "rosette" plants, and it was felt that results obtained by the grid method would give due prominence to the position occupied by these plants. The analyses were carried out in October, 1932.

In addition to the two plots, an analysis was made of closely-cropped pasture in the immediate vicinity of the enclosed plots. By this means, it was possible to judge whether the taking of three-weekly cuts over a period of four years had seriously affected the composition of the herbage of the unmanured plot as compared with that of the untreated pasture.

The results of the analyses are incorporated in the table (overleaf) and, as on the unmanured plot the total grasses and legumes cover only approximately 50 per cent. of the ground, the data referring to the miscellaneous herbs are set out in rather greater detail than is usual. Especially did this seem desirable in view of the fact that certain of these herbs have a definite grazing value, e.g., *Plantago lanceolata* and *Poterium sanguisorba*.¹¹

In a small area inside the enclosure that had been unmanured and uncut for five years, the grasses were similar to those of the cut plots except that perennial oat-grass seemed more abundant. *Trifolium pratense* was more abundant and *Trifolium repens* less abundant than on the cut plots.

In the unenclosed pasture, Crested Dogstail occupied a conspicuous position because the flowering stems were ungrazed, but fine-leaved fescue constituted the dominant plant. Patches of bent occurred, whilst Yorkshire Fog, though not abundant, was well distributed, and, in the lower parts of the area, Cocksfoot occurred. Prominent among the herbs were *Scabiosa arvensis*, *Centaurea nigra*, *Galium verum*, *Campanula rotundifolia*, *Prunella vulgaris*, *Poterium sanguisorba*, *Helianthemum chamaecistus*, *Plantago lanceolata*, *P. media*, and *P.*

INTENSIVE TREATMENT OF A WILTS. DOWN PASTURE

BOTANICAL ANALYSES OF PLOTS ON WILTSHIRE DOWNS SHOWING PERCENTAGE OF GROUND COVERED BY EACH SPECIES.

(Standard Errors attached).

	Manured Per cent.	Unmanured Per cent.	Untreated pasture Per cent.
Fine-leaved Fescue (<i>Festuca ovina</i> et var.)	56.3 ± 1.35	34.9 ± 1.9	34.6 ± 2.0
Crested Dogstail .. (<i>Cynosurus cristatus</i>)	5.8 ± 1.01	5.1 ± 0.34	4.7 ± 0.45
Timothy (<i>Phleum pratense</i>)	3.0 ± 0.79	2.6 ± 0.70	1.0 ± 0.34
Yorkshire Fog .. (<i>Holcus lanatus</i>)	1.3 ± 0.30	1.0 ± 0.08	2.1 ± 0.50
Bent (<i>Agrostis</i> spp.)	—	—	1.0 ± 0.24
Perennial Oat-grass (<i>Avena pratensis</i>)	2.4 ± 0.36	1.5 ± 0.40	2.1 ± 0.20
Smooth-stalked Meadow Grass (<i>Poa pratensis</i>)	0.7 ± 0.30	—	0.2 ± 0.10
White Clover .. (<i>Trifolium repens</i>)	3.2 ± 0.70	1.9 ± 0.19	2.0 ± 0.44
Red Clover .. (<i>Trifolium pratense</i>)	Tr.	Tr.	0.7 ± 0.20
Other Legumes .. (<i>Other Legumes</i>)	Tr.	2.4 ± 0.77	3.5 ± 0.09
Ribwort (<i>Plantago lanceolata</i>)	1.6 ± 0.56	11.8 ± 0.89	11.3 ± 0.14
Hoary Plantain .. (<i>Plantago media</i>)	22.1 ± 2.78	14.9 ± 0.67	9.8 ± 2.49
Burnet (<i>Poterium</i> (Salad Burnet) <i>sanguisorba</i>)	0.2 ± 0.03	7.1 ± 1.80	9.2 ± 1.81
Rock Rose .. (<i>Helianthemum</i> <i>chamaecistus</i>)	0.7 ± 0.31	2.8 ± 0.64	2.0 ± 0.70
Daisy (<i>Bellis perennis</i>)	0.4 ± 0.25	0.5 ± 0.19	2.3 ± 0.61
Sorrel (<i>Rumex acetosa</i>)	1.2 ± 0.37	0.6 ± 0.26	1.0 ± 0.39
Scabious .. (<i>Scabiosa</i> sp.)	Tr.	0.5 ± 0.31	3.0 ± 0.90
Other herbs	0.4	2.9	2.9
Moss	Tr.	5.4 ± 0.81	1.9 ± 0.70
Lichen (<i>Peltigera</i> sp.)	—	—	0.2
Bare space	0.7 ± 0.15	4.8 ± 0.40	4.5 ± 0.82
Total Grasses	69.5	43.1	45.7
„ Legumes	3.2	4.3	6.2
Other Herbs	26.6	42.4	41.5

major, together with a few plants of *Senecio jacobaea*, *Primula vulgaris*, and *Carduus* sp. *Potentilla anserina* was present in the upper part of the pasture adjoining an arable field. Bordering on the road, and growing on soil exposed by recent road-widening operations, Cocksfoot and Perennial Oatgrass were flourishing.

This list of plants, producing seed in the vicinity of the experimental plots, gives an indication of the plants apt to invade the plots if the conditions were favourable to such invasion.

Discussion.—A comparison of the data for the unmanured plot with those for the hard-grazed plot suggests that the cutting without manuring has had, over the period of the trial, substantially the same effect as pasturing, with the exception that certain weeds may have suffered a reduction. This, as would be expected, is most apparent in the case of the "weeds" that are normally ungrazed or only grazed to a slight extent, e.g., *Galium verum*, *Centaurea*

INTENSIVE TREATMENT OF A WILTS. DOWN PASTURE

nigra and *Scabiosa* sp. In addition, the moss on the grazed portion is less than on the unmanured plot.

Comparing the manured and unmanured plots, the chief feature is the increase of grasses and reduction of miscellaneous herbs in the former. The production of a more grassy herbage, following a manurial treatment in which nitrogenous manures play a prominent part, is, of course, to be expected^{4, 12, 3}. The increase in grasses is mainly due to the increase of the fine-leaved fescues, which are noted for the way they respond to dressings of ammonium salts^{9, 6, 3}. The other grasses show slight increases, but no increases to which any significance can be attached. As far as the grasses are concerned, however, the treatment has simply resulted in an increase of the already dominant species, the increase being mainly at the expense of the miscellaneous herbs. The legumes of the two plots are noticeably low and there appears to be no significant difference between the two plots. Of the increase of 26 per cent. grasses, 9.5 per cent. is accounted for by a decrease in bare space and moss.

In addition, *Plantago media* has increased from 15 per cent. to 22 per cent., so that the herbs, excluding *P. media*, show a decrease of 22 per cent., this being mainly due to the decrease in *Plantago lanceolata* and *Poterium sanguisorba*. The reduction in *Plantago lanceolata* from 12 per cent. to less than 2 per cent. is comparable with results obtained elsewhere,⁹ where manuring with ammonium salts has resulted in striking reductions in the amount of this plant.

The reduction in *Poterium sanguisorba* indicates suppression of a deep-rooted¹ plant capable of producing palatable herbage during periods of drought¹¹. The increase in yield, due to manuring, however, more than offsets the possible disadvantage of this. The other miscellaneous herbs all show small decreases, but, in general, their amount in either of the plots is not appreciable.

The reduction in the proportion of "weeds" lends support to the view of Blackman⁴ that the ammonium ion has a toxic effect on "weeds." The increase in the amount of *Plantago media* might be cited as evidence in favour of the nontoxicity of this ion to this particular plant. The differential response of the two species of *Plantago* under this treatment is difficult to relate to botanical differences between the two plants. The two species have root systems

INTENSIVE TREATMENT OF A WILTS. DOWN PASTURE

not markedly dissimilar,¹ and so there is no question of a deep-rooted plant being suppressed and a shallow-rooted plant encouraged.

References to the ecology of *P. media* are not plentiful. That it is a typical plant of calcareous soils is well known. Anderson¹ records its greater abundance in strongly leached areas, whilst Brenchley⁵ notes that its presence is considered by farmers to be a sign that the land is in good "heart."

The net result of the manuring and cutting as against cutting alone has been the production of a turf in which almost 80 per cent. of the area is occupied by fine-leaved fescues and hoary plantain. It is not known to what extent the latter may be grazed, but it seems that the manured plot still has over 20 per cent. of the ground covered by relatively unproductive plants, although this represents a considerable improvement over the unmanured turf, which contains 20 per cent. of *Plantago media* and other undesirable herbs, nearly 10 per cent. of moss and bare space, and 19 per cent of *Plantago lanceolata* and *Poterium sanguisorba*—both of which, while they are grazed, are not very productive.

Summary.—Data presented above show that on a Wiltshire Down pasture a system of manuring and frequent cutting, as against cutting only, has resulted in:—

- (1) Increase of grasses, notably fine-leaved fescues.
- (2) Increase in *Plantago media*.
- (3) No significant change in the total legumes.
- (4) A decrease in miscellaneous herbs.
- (5) A decrease in the area covered by moss.
- (6) A decrease in the bare spaces.

In conclusion the writer wishes to thank Mr. A. W. Ling who suggested the desirability of carrying out the botanical analyses that have been described, and with whose Department the writer was associated when this work was carried out.

REFERENCES.

- ¹ Anderson, V. L.: Water Economy of the Chalk Flora. *Jour. Ecol.*, 16, 72, 1927.
- ² Armstrong, S. F.: Botanical and Chemical Composition of certain Pastures and Meadows. *Jour. Agric. Sci.*, 2, p. 281.
- ³ Armstrong, S. F.: British Grasses and their Employment in Agriculture. Cambridge, 1921.
- ⁴ Blackman, G. E.: An Ecological Study of closely-cut Turf treated with Ferrous and Ammonium Sulphate. *Ann. of App. Biol.*, 19, 204, 1932.
- ⁵ Brenchley, W. E.: West Country Grassland. *Jour. Bath and West and Southern Counties Soc.*, XI, 1916-17.

INTENSIVE TREATMENT OF A WILTS. DOWN PASTURE

- ⁶ Gardner, Smith & Williams: Further observations on Nitrogenous Manuring of Grassland. *Jour. Agric. Sci.*, 21, 780, 1931.
- ⁷ Long, H. C.: Weeds of Grassland, IV. *This JOURNAL*, XXXVII, 12, March, 1931.
- ⁸ Smith & Crampton: Grassland in Britain. *Jour. Agric. Sci.*, 6, 1, 1914.
- ⁹ Stapledon, R. G.: Pasture Problems Response of individual species under manures. *Jour. Agric. Sci.*, 6, 499.
- ¹⁰ Stapledon, R. G. & Jones, R.: Seeds Mixtures for Temporary Grass. *Welsh Jour. Agric.*, I, 1925.
- ¹¹ Stapledon, R. G., & Hanley, J. A.: Grassland, Its Management and Improvement. Oxford, 1927.
- ¹² Woodman, H. E., & Underwood, E. J.: Nutritive Value of Pasture, VIII. Influence of Intensive Fertilizing on Yield and Composition of good permanent pasture. *Jour. Agric. Sci.*, XXII, 1932.
- ¹³ Report to Development Commissioners. *This JOURNAL*, XXXIX, No. 1, April, 1932.

MARKETING NOTES

Pigs and Bacon Marketing Schemes:—Results of Pig Grading.—There was still further improvement in the quality of pigs delivered under contract in April, the latest month for which a complete analysis is available. The following table shows grading results for November, 1933 (the first month of the scheme), and for March and April, 1934:—

				1933. November. Per cent.		1934. March. Per cent.		1934. April. Per cent.
Grade A	..	..	..	4.9	..	14.1	..	15.3
„ B	..	..	..	20.1	..	30.6	..	31.4
„ C	..	..	..	18.8	..	20.2	..	24.3
„ D	..	..	..	33.2	..	19.5	..	22.5
„ E	..	..	..	3.2	..	1.5	..	1.3
Class 4 (ungraded)	..	..	..	4.5	..	1.0	..	1.3
Ungraded but accepted by Curers	..	..	..	7.8	..	9.8	..	2.0
Rejected	..	..	..	7.5	..	3.3	..	1.9
				100		100		100

46.7 per cent. of the pigs delivered in April were “ bonus ” pigs (Grades A and B), compared with 44.7 per cent. in March and 25 per cent. in November last. Rejects had fallen to less than 2 per cent.

1935 Contract Terms.—Discussions between the Pigs and Bacon Marketing Boards with regard to contract terms for the next period (Jan. 1 to Dec. 31, 1935) have already commenced. The Boards have in mind the necessity for sending out contract forms at a much earlier date than on previous occasions, to allow ample time for the signing and confirmation of contracts.

Co-option of Additional Bacon Board Members.—Following the amendment of the Bacon Marketing Scheme to provide for the co-option of two additional members, referred to in the July JOURNAL, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland have approved the co-option by the Bacon Board, after consultation with the Market Supply Committee, of the Hon. Jasper Ridley and Mr. Patrick Spens, K.C., M.P., as members of the Board.

Price of Bacon Pigs for July.—The price of the “ basic ” pig (Class 1, Grade A) for July, under the form of contract

MARKETING NOTES

prescribed by the Pigs Board, was 11s. 7d. per score, a decrease of 1d. on the price for June.

Amendment of the Bacon Marketing Scheme.—The Public Inquiry held by Mr. N. L. Macaskie, K.C., into an objection lodged against a proposed amendment of the Bacon Marketing Scheme, opened on July 18, and was concluded on the same day.

The Bacon Indemnity Loan.—Reference was made in these notes for December, 1933, to the Government's decision to make a loan to the Bacon Marketing Board from which efficient bacon curers could be indemnified against an agreed part of any losses attributable to the circumstances arising from the large volume of pig contracts in the four months November, 1933, to February, 1934. The Government's decision was followed by the passing of the Agricultural Marketing (No. 2) Act, 1933, which was referred to in these notes for January, 1934.

Amendments to the Bacon Marketing Scheme, enabling the Bacon Board to distribute the loan to registered curers, were submitted on March 16, 1934, and, after passing through stages laid down in the Marketing Acts, were brought into force on June 21, 1934, by the Bacon Marketing Scheme (Amendment) Order, 1934.* An Order empowering the Pigs Board to guarantee the loan, and making certain consequential amendments to the Pigs Marketing Scheme, came into force on June 25, 1934.†

The way was then clear for the making of the loan, the amount of which had been determined at £160,000. Of this sum, £144,000 was advanced from the English Agricultural Marketing Fund on June 26, 1934, and the balance, namely, £16,000, from the Scottish Agricultural Marketing Fund on July 5, 1934. The whole of the loan is to be repaid in six monthly instalments, commencing on July 31, 1934.

The loan is to be administered by a Committee of nine persons consisting of three representatives of each of the Boards and three representatives appointed by the Minister. The Minister has appointed Sir Wyndham Portal, Mr. H. G. Howitt and Dr. W. H. Coates as his representatives.

Repayment of the loan will be effected by means of a levy on bacon curers, who will recoup themselves from pig producers. The levy, the amount of which will be deter-

* S.R. & O. 1934, No. 679. Price 1d. net.

† S.R. & O. 1934, No. 685. Price 1d. net.

MARKETING NOTES

mined from time to time by the Pigs Marketing Board, will apply to all pigs sold under contract until December 31, 1934. In the case of pigs sold by producers direct to curers, the levy will be deducted from the contract price by the curer, who, in turn, will be required to pay to the Bacon Marketing Board the total amount of such deduction. Where pigs are sold by a producer to the Pigs Marketing Board, the deduction will be made by that Board, who will pay over the proceeds of such deductions to the Bacon Marketing Board. As a matter of administrative convenience the Pigs Marketing Board will, in fact, also collect from bacon curers the levy on pigs sold by producers direct to curers, and will transmit the whole amount to the Bacon Board, who will keep it in a separate account.

The rate of levy, which is retrospective to March, 1934, has been fixed as follows:—

March and April, 1934	.	.	6d. per score.
May, 1934	..	..	2d. „ „
June, 1934	.	.	3d. „ „

The levy for the remaining months will be fixed from time to time according to the revenue required.

The interest on the loan has been fixed at the rate of $3\frac{1}{2}$ per cent. per annum and is payable monthly together with the instalments of principal. The loan is secured by a floating charge on all the assets of the Bacon Board, supported by a guarantee by the Pigs Board to repay the loan with interest. It has been agreed between the Boards that the primary liability for repayment of the full amount of the loan of £160,000 rests with the Pigs Marketing Board, who have further agreed that the Bacon Marketing Board may recover from the Pigs Board any portion of the loan, interest or charges that may be paid by the Bacon Board to the Minister, or any other person, in liquidation of the liability.

Repayments on account of the loan from the proceeds of the levy in March, April, and May, have already been made. Sums of £8,100 and £14,400 on account of the English portion of the loan were repaid on July 6 and 9 respectively. The amount of the English loan now outstanding, after charging interest, is £121,677.

Amendment of the Hops Marketing Scheme, 1932.—
A resolution approving the amendment of the Hops Marketing Scheme was debated in the House of Lords on July 5 and passed without a division. A similar resolution came

MARKETING NOTES

before the House of Commons on July 11, and after a motion against the resolution had been defeated by 139 votes to 36, the resolution was agreed to. An Order was accordingly made by the Minister on July 13, in pursuance of Section 1 of the Agricultural Marketing Act, 1931, approving the amendment and bringing it into force on the following day.

The amendment, which was submitted by the Hops Marketing Board, provides, *inter alia*, for the division of a registered producer's hops into "quota" and "non-quota" hops for selling purposes. The datum line for the calculation of a producer's quota for hops of any season is the basic quota allotted to him by the Board. In general this will be his average production during the five seasons 1928 to 1932. Basic quotas will be allotted only to producers who were registered on September 1, 1933, and were then occupying farms on which hops were grown in 1932. A safeguard is introduced, however, to ensure that an owner-occupier who centralized his production on one farm during the five-year period shall not suffer on that account in the allocation of basic quotas. It is also provided that the quota shall not represent more than 20 cwt. nor less than 8 cwt. per acre on the 1932 acreage, nor less than 40 cwt. in all.

A registered producer's selling quota for hops for any season will be the same fraction of the total market demand for English hops of that season as his basic quota is of the total of all basic quotas. A registered producer, however, can still continue to grow and offer to the Board for sale all the hops that he is capable of producing. As hitherto, all hops tendered to the Board will be valued before sale, but if, in any season, a producer tenders hops in excess of the quota allotted to him, the hops of highest value are to be selected for treatment as quota hops. The Board's net receipts from the sale of all hops will then be applied first to the payment of registered producers in proportion to the values of the quota hops of that season supplied by each producer, and then, if there is any balance, to payment in proportion to the values of non-quota hops.

If annual quotas exceed 110 per cent. of basic quotas, the Board must allot new basic quotas. Registered producers have the right to resort to arbitration on the allotment of basic quotas to them by the Board, provided that they

MARKETING NOTES

exercise their right within one month. If for any reason a registered producer ceases production, then his basic quota lapses. In this event, the Board are required to allot a similar basic quota to the person nominated by the owner of the farm, or failing nomination, to the next occupier. If, however, there is no agreement to grow hops, any hops produced are to be reckoned in the tenant's basic quota, which is to be transferable by him and to lapse only with his consent.

The quota provisions included in the amendment are operative for a period of five years only, i.e., until July 31, 1939. There are, however, a certain number of minor modifications of the scheme designed to bring it into line with other marketing schemes.

The quota proposals had their origin in certain provisions of the original scheme submitted to the Minister in 1932. These provisions, however, were eliminated from the scheme before it was presented to Parliament. They had been rather hastily framed, but in rejecting them Sir John Gilmour made it quite clear that the decision did not reflect on the principle of a quota system for the hops industry. Revised proposals were accordingly submitted by the Hops Marketing Board after they had had some experience of the working of the scheme. These were modified by the Minister with the assent of the Board, after a public inquiry had been held into objections, and were laid before Parliament in December last. Subsequently a Provisional Committee consisting of four representatives each of the Hops Marketing Board and the Brewers' Society, and three independent members, was appointed by the Minister to consider certain matters supplementary to the amendments. This Committee presented a report which has been printed and laid before Parliament (Cmd. 4628. Price 3d. net.).

The work of the Provisional Committee was directed mainly towards the negotiation of an agreement that would form the basis of the collaboration of growers with brewers in the long-term planning of hops production and marketing. In the normal process of the Agricultural Marketing Acts, this collaboration, between the producers of the primary and those of the secondary product, takes the form of a Development Scheme, such as is now promoted between the Pigs Marketing Board and the Bacon Marketing Board. In the present instance, however, the producers of the secondary product—beer—are not organized under the Acts,

MARKETING NOTES

and, in place of the Development Board, a Permanent Joint Committee, composed similarly to the Provisional Committee, is to be set up.

The form of agreement that has been reached between the Hops Marketing Board and the Brewers' Society is designed to operate for a period of five years—the time during which the amendment of the Scheme will operate. The agreement provides for:—

1. The collaboration of the brewers in the estimation of the total market demand for hops each year;
 2. An average price for the whole of the estimated demand that has been accepted by both parties as reasonably representative of the cost of production plus a fair profit;
 3. Provisions to secure that—
 - (a) hop growers shall not suffer if brewers fail to produce the whole of the estimated demand;
 - (b) brewers shall not be penalized if English growers fail to produce the whole of the estimated requirements of marketable hops;
 4. An agreed maximum level of importations of foreign hops that, if exceeded, should be controlled by the regulation of imports.
- For the purpose of 3 (a) above, the brewers have agreed to raise a fund by a levy of 10s. per cwt. on English hops.

Milk Marketing Scheme:—Prices for June.—The wholesale contract price for liquid milk in June was 1s. 0d. per gal. in all regions. The manufacturing price for milk manufactured into butter or cheese or condensed milk for export was 3½d. per gal. The average price realized for all milk going into manufacture was 5.46d. per gal. as compared with 5.47d. in the previous month.

Regional pool prices and producer-retailers' contributions compared with those for May were as follows:—

Region.	Pool Price.		Producer-Retailers' Contributions.	
	May.	June.	May.	June.
	(Pence per gal.)		(Pence per gal.)	
Northern ..	10½	10½	1½	1½
North-Western ..	10	10½	1½	1½
Eastern ..	10½	10½	1½	1½
East-Midland ..	10	10½	1½	1½
West-Midland ..	9½	9½	2½	1½
North Wales ..	9½	10	2½	1½
South Wales ..	10	10½	1½	1½
Southern ..	10½	10½	1½	1½
Mid-Western ..	9½	10	2½	1½
Far-Western ..	9½	10	2½	1½
South-Eastern ..	10½	10½	1½	1½
Unweighted Average	10.02	10.25	1.83	1.56

Producer-retailers who did not sell milk by wholesale, other than on contracts carrying level-delivery premiums,

MARKETING NOTES

were credited with a level-delivery premium of $\frac{1}{4}$ d. per gal. off the above contributions.

The inter-regional compensation levy was fixed at 1d. per gal. on all liquid milk sales, and the whole of the proceeds, amounting to £209,574, together with £59,622 drawn from the Inter-Regional Compensation Fund, were apportioned to the regional pools.

As in May, no general expenses levy was charged in June. In May, however, a deduction of $\frac{1}{4}$ d. per gal. was made in respect of all sales of milk as the producers' share of the joint contribution of $\frac{1}{4}$ d. per gal. made by the Board and the buyers for milk publicity purposes.

Sales of contract milk were estimated as follows:—

	Gallons.	Per cent.
Liquid milk	43,632,980	60.4
Manufacturing milk ..	28,618,873	39.6
	72,251,853	100.0

In addition, milk manufactured into cheese on farms was estimated to be 3,673,455 gal., compared with 3,453,613 gal. in May.

Co-opted Members.—The Minister has approved the co-option of two members by the elected members of the Board, after consultation with the Market Supply Committee. The co-opted members are Lord Cranworth and Mr. M. Hely Hutchinson. The latter served on the first provisional Board as one of the two special members nominated by the Minister.

Chairman and Executive Committee.—Mr. T. Baxter has been re-elected Chairman and Mr. Ben Hinds has been appointed Vice-Chairman of the new Board. The following members have been appointed as the Executive Committee:—

Mr. T. Baxter (Chairman).
Mr. B. Hinds (Vice-Chairman).
Lt.-Col. J. F. Duncan.
Mr. J. Garton.
Mr. M. Hely Hutchinson.
Mr. J. Joyce.
Mr. C. T. Sproston.

Processed Milks.—In the February, 1934, issue of this JOURNAL (pp. 1059-60), were given details of the arrangements made for the regulation of imports during the period June-December, 1933.

(a) *Arrangements for January-June, 1934.*—Exporting

MARKETING NOTES

countries were subsequently requested to continue the regulation of supplies during the first two quarters of this year. The principal foreign supplying countries were asked to agree to the following reductions as compared with the corresponding months of the period June, 1932, to May, 1933:—

	Jan. 1934	Feb. 1934	Mar. 1934	From Apr. 1 1934*
	per cent.	per cent.	per cent.	per cent.
Condensed skimmed milk ..	17½	20	22½	22½
Cream	20	22½	25	30
Condensed whole milk .. }	20			20
Milk powder }				

Foreign countries with small interests in the market, together with the Southern Dominions and Canada, co-operated on a standstill basis.

Supplies from the Irish Free State have also been regulated since Jan. 1 last. Imports of cream were limited to 15,000 cwt. during the first six months of this year—this quantity representing a reduction of rather more than 8 per cent. on imports in the first half of 1933. Imports of condensed milks were subject to reductions of 10 per cent. and 12½ per cent. during the first two quarters respectively, as compared with imports in the corresponding quarters of 1933.

(b) *Arrangements for July-September, 1934.*—In reply to a question put in the House of Commons on July 9, the Minister made the following announcement regarding the continuance of regulation during the third quarter of this year.

“The Governments of the foreign countries mainly concerned in the United Kingdom market for condensed milk, milk powder, and cream have been asked to arrange for the following reductions in supplies as from July 1, the reductions in each instance being based on imports during the corresponding months of the year previous to the introduction of the voluntary import regulation arrangements, namely, June, 1932, to May, 1933:—

Condensed skimmed milk.—Continuance for the time being of the reduction of 22½ per cent.

Condensed whole milk and milk powder.—Continuance for the time being of the reduction of 20 per cent.

Cream.—Reduction of 33½ per cent. for the quarter ending September 30.

The Governments of the Commonwealth of Australia and of the Dominions of Canada and New Zealand have been asked to continue during the quarter ending September 30 the co-operation which they have been good enough to afford since the regulation of imports of processed milks was first introduced. Arrangements are also being

* The reductions for condensed skimmed milk and cream to cover the three months April-June, those for condensed whole milk and milk powder to be on a monthly basis.

MARKETING NOTES

made to secure reductions in imports of condensed whole and skimmed milk and cream from the Irish Free State.

It will be appreciated that, since the bulk of our imports of processed milks, other than cream, from foreign countries is supplied by the Netherlands, the position as regards import regulation is, for the time being, governed by the agreement recently concluded for the maintenance of the *status quo* in trade relations between the United Kingdom and the Netherlands, pending the negotiation of a trade agreement."

Milk Bill, 1934.—The Milk Bill received a second reading in the House of Commons on June 7. It was then referred to a Committee of the whole House and considered on June 13-19. The Bill emerged from Committee substantially unchanged and was further considered on Report stage on June 25. Third reading was taken on June 29. The Bill received a second reading in the House of Lords on July 12, and has passed through all its stages.

Farm Cheesemakers.—An arrangement has been made by the Milk Marketing Board for the current summer contract period whereby farm cheesemakers are enabled to share, to some extent, in the benefits of the liquid-milk market and the system of Government advances to the milk industry, without selling their milk off the farm. The arrangement is consequential upon the Government's Milk Policy of guaranteed minimum prices for manufacturing milk, which makes provision for the same rate of advance to accrue to the Milk Marketing Board in respect of milk manufactured into cheese on farms as accrues in respect of milk manufactured into cheese in factories.

The new arrangement is incorporated in a special agreement entered into between the farm cheesemakers and the Milk Marketing Board which is operative from the date on which it is signed until September 30, 1934. The agreement provides for (a) the purchase by the Board at the monthly regional pool price of the producer's total output of milk, except milk retained on the farm for purposes other than the manufacture of cheese; (b) the manufacture of this milk by the producer on behalf of the Board; and, (c) the purchase of the cheese from the Board by the cheesemaker at a price less than the regional pool price by the amount of the advance which accrues to the Board from the Government and less an additional $\frac{1}{2}d.$ per lb. in respect of Caerphilly or soft cheese, or $1d.$ per lb. with all other cheese.

The net effect of this arrangement is to secure that the

MARKETING NOTES

cheesemaker who enters into an agreement with the Board is subsidized in respect of milk manufactured into cheese on the farm by the amount of the advance which accrues from State funds and by an additional 1d. or $\frac{1}{2}$ d. per gal. from the general funds of the Milk Marketing Board, according to the variety of cheese manufactured. How far such a scheme will be successful in retaining milk for farm cheese manufacture must depend on two main considerations, (a) the level of regional pool prices for milk, and (b) the price commanded by farm cheese.

Under the agreement the manufacture of cheese does not involve any transfer of the milk from the producer's farm. Since, however, a net payment will be due to the farm cheesemaker on the gallonage so converted, it is necessary to ascertain the quantity of milk dealt with; this is calculated from the weight of the cheese manufactured, and for this purpose 1 lb. of cheese is taken as being equivalent to 1 gal. of milk.

The main conditions relating to the manufacture and sale of cheese are set out in the first schedule to the agreement as follows:—

1. All cheese shall be manufactured by the producer from whole milk, and shall contain not less than 45 per cent. of fat in the dry matter.

2. Every cheese shall be stamped on the side in indelible characters with the date of its manufacture immediately on being taken from the press and (except in the case of Caerphilly, soft cheese or Blue Veined) shall be retained on the farm for a period of not less than 14 days after the date of its manufacture.

3. The producer shall not without the written consent of the Board manufacture cheese except from milk produced upon the said farm and sold to the Board under this Agreement.

4. The producer shall at his own expense supply all necessary labour together with suitable utensils, plant and accommodation for the said manufacture.

5. The producer shall not without the written consent of the Board sell any cheese purchased from the Board as aforesaid except by substantial lots. The expression "substantial lot" means a consignment of not less than 56 lb. of cheese.

It is also provided that the producer shall submit monthly returns to the Board showing the quantities of milk and cheese produced and sold; that he shall keep appropriate daily records of his output and sales; and that he shall allow his premises, his herd and his stocks of milk and cheese to be inspected at any reasonable time by any person authorized by the Board.

Provision is made in the agreement whereby the Board

MARKETING NOTES

can elect to take delivery of the milk in liquid form instead of having it manufactured by the cheesemaker. In this event, however, any loss which the cheesemaker sustains as a result of the change will be made good by the Board, and provision is made for arbitration as to the amount of the loss where agreement cannot be reached between the Board and the cheesemakers concerned.

Sugar-Beet Marketing Scheme.—The Public Inquiry held by Mr. F. J. Wrottesley, K.C., into objections lodged against the proposed Sugar-Beet Marketing Scheme, opened on July 30 and was continued on the following day.

British Sugar (Subsidy) Bill, 1934.—The Bill was passed without amendment and received Royal Assent on July 25.

Potato Marketing Scheme.—The Potato Marketing Board decided recently to rescind the riddle regulations imposed on April 10 last in regard to the 1933 main crop.

The Board has decided the terms on which merchants will be authorized and proposes to make authorization operative from September 1 of the present year. Applications are now being considered.

A further announcement made by the Board indicates that potato growers, by a substantial majority, have voted in favour of the abolition of sales of potatoes on commission. Of the producers who voted, 78.90 per cent. were in favour of such abolition, representing 82.43 per cent. of the total acreage of all those who voted.

The Board has already indicated its intention not to exercise its powers in the matter before September 1 next, and will consider early in August the resolutions necessary to carry into effect the producers' decision to prohibit sales on commission, and to define precisely for those concerned the types of transactions that will be prohibited. Any exemptions from the operation of the prohibition, which may be considered desirable, will be announced by the Board in due course.

Potatoes.—Reference was made in the July, 1934, issue of this JOURNAL (pp. 362-3), to the voluntary arrangements for limiting imports of *early potatoes* from foreign countries during the 1934 season to the quantities sent in 1933.

Figures of imports from foreign countries up to the end

MARKETING NOTES

of June, 1934, and in the same period of 1933, are given below. Figures of supplies from British countries are also given.

<i>From</i>	<i>Jan.-June, 1934 (6 months), tons.</i>	<i>Jan.-June, 1933 (6 months), tons.</i>
Spain and Canary Islands ..	63,900	76,400
Netherlands	1,600	1,850
Belgium	700	500
Italy	100	60
Channel Islands	64,000	66,150
Malta	1,300	450
Total: All Sources ..	131,600	145,410

Reference was also made in the July issue (p. 364) to the voluntary arrangements for the regulation of imports of *maincrop potatoes* up to the end of April, 1934. These arrangements were subsequently continued for the months of May and June, when the maincrop season draws to a close. During these two months, the Netherlands were asked to limit supplies to 2,000 tons in all, and the Irish Free State to 1,200 tons, other countries being asked to continue to withhold from the market. Total imports of maincrop potatoes from the Netherlands during these two months amounted to 689 tons, and from the Irish Free State to 452 tons.

The final position for the ten months from September, 1933, to June, 1934, a period comprising virtually the whole maincrop season was as follows:—

<i>From</i>	<i>Imports: Sept., 1933- June, 1934. Tons.</i>	<i>Authorized maximum figure of Imports: Sept., 1933-June, 1934. Tons.</i>
Netherlands	10,606	18,000
Belgium	58	270
Irish Free State	6,017	9,500*
Other countries	200	—
Total	16,881	27,770

Eggs.—In the April issue of this JOURNAL (pp. 53-4) was given an account of the situation in the egg and poultry industry that prompted the adoption of a measure of import

* Exclusive of seed potatoes and small consignments, not exceeding one ton, moved across the Northern Ireland land boundary in farmers' own carts during the four months Sept.-Dec., 1933, only.

† Estimated, no distinction between maincrop and early potatoes being made in the official trade statistics.

MARKETING NOTES

regulation from March 15 last. The Minister's statement in the House of Commons announcing the steps that were being taken was also given.

The subsequent progress and effects of regulation were summarized in a reply given by the Minister to a question in the House of Commons on July 9, as follows:—

"The average wholesale price of National Mark standard English eggs was 10s. 10d. per 120 in June, 1934; 11s. 5d. in 1933; 10s. 8d. in 1932; and 10s. 6d. in 1931. First quality English eggs, other than National Mark, averaged 9s. 9d. in June, 1934, compared with 10s. in each of the previous three years. The official import statistics for June of this year are not yet available, but, according to information published by the Imperial Economic Committee, recorded imports of eggs in shell in the four weeks ended June 30 last were about 7½ per cent. greater than in the corresponding period of last year. Total imports of eggs in shell during the fifteen weeks March 18 to June 30, however, were some 500,000 great hundreds, or 10 per cent., lower than imports in the corresponding period of 1933. The action to be taken to regulate imports of eggs after the present standstill arrangement expires on September 14 next, is under consideration."

National Mark Beef.—The number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during April, May and June, 1933 and 1934, and the three weeks ended July 21, 1934, were as follows:—

LONDON AREA.

	<i>Home-killed.</i>	<i>Scotch Sides for London</i>	<i>Scotch Sides marked at Smithfield.</i>	<i>Total.</i>
April, 1933 ..	7,789	5,191	4	12,984
" 1934 ..	8,829	5,116	—	14,945
May, 1933 ..	8,963	5,614	5	14,582
" 1934 ..	8,878	6,555	—	15,433
June, 1933 ..	6,697	5,028	4	11,729
" 1934 ..	7,275	6,171	—	13,446
Three weeks ended July 21, 1934 ..	4,677	3,481	—	8,158

BIRKENHEAD AREA.

(Including Liverpool.)

	<i>For London (included under Home-killed in London Area).</i>	<i>Liverpool (for local requirements).</i>	<i>Total.</i>
April, 1933 ..	2,070	—	2,070
" 1934 ..	2,194	1,320	3,514
May, 1933 ..	1,625	—	1,625
" 1934 ..	2,214	1,175	3,389
June, 1933 ..	721	—	721
" 1934 ..	1,462	1,060	2,522
Three weeks ended July 21, 1934 ..	760	836	1,596

MARKETING NOTES

BIRMINGHAM AND YORKSHIRE AREAS.

	<i>Birmingham.</i>	<i>Leeds.</i>	<i>Bradford.</i>	<i>Halifax.</i>
April, 1933	.. 3,832	1,817	1,494	317
" 1934	.. 4,561	2,341	1,864	536
May, 1933	.. 4,539	2,293	1,824	475
		2,157	1,570	440
June, 1933	.. 3,349	1,799	1,372	334
" 1934	.. 3,864	1,939	1,486	406
Three weeks ended July 21, 1934	.. 2,466	1,181	941	278

National Mark Fresh Vegetables.—National Mark grading schemes are now in operation for a number of the more important fresh vegetables, viz.:—asparagus, green beans, beetroots, broccoli and cauliflower, Brussels sprouts, cabbage greens and cabbage, cabbage lettuce, carrots, celery, horseradish, leeks, mushrooms, onions, parsnips, green peas, radishes, shallots, swedes, topped turnips and watercress. Details of these schemes have appeared in recent issues of the JOURNAL.

Standard grades, packages and methods of packing have now been provisionally formulated for most of the remaining vegetables of commercial significance, as follows:—

Cos lettuce.	Bunched turnips.
Mustard and cress.	Witloof chicory.
Endive.	Artichokes (Jerusalem and globe).
Seakale.	Mint.
Savoy and red cabbage.	Parsley.
Scotch kale.	Sage.
Sprouting broccoli.	Thyme.
Spinach.	
Broad beans.	

Demonstrations of the vegetables packed according to these standards are being staged at a number of agricultural and other shows this year. Growers and distributors are being invited to offer their criticisms of the proposals, full details of which are set out in the Ministry's Demonstration Leaflet W, which has recently been issued.

The Ministry has also published Marketing Leaflet No. 57A, which contains comprehensive lists of authorized packers and registered distributors of National Mark fresh fruit and vegetables.

Copies of both leaflets may be had free of charge on application to the Ministry.

Marketing Demonstrations.—At the Royal Lancashire Show, Bolton, August 2 to 6, the Ministry's pavilion will include, besides comprehensive displays of National Mark products and a working egg-grading demonstration, exhibits by the Pigs, Bacon, Milk and Potato Marketing Boards

MARKETING NOTES

and the B.B.C. In addition to this Show, the Ministry will visit the following one-day Shows during August:—Durham (Sunderland), August 6; Tring, August 9; and Bakewell, August 9. The National Mark demonstrations, including a working tomato-grading demonstration, will also be staged at the Southport Flower Show, August 22 to 24. At the Sandy Show, Aug. 30, the demonstrations will be devoted entirely to the National Mark vegetables schemes.

The National Mark: A Rural Survey.—The Ministry has recently conducted, through its official advertising agents, an investigation in certain rural districts of Somerset, Suffolk, Sussex, Worcestershire and Yorkshire, in order to ascertain how far the National Mark is known among housewives and retailers. About nine months previously, an investigation, on similar lines, was made in London, Birmingham, Cardiff, Leeds and Nottingham.

For the purpose of the rural survey, 500 housewives of all classes, ranging from those who keep at least two or three servants to the wives of labourers and unskilled workers, and 100 retailers, each keeping the largest shop of its kind in the rural town or village visited, were interviewed. The percentage of housewives who were cognizant of the National Mark is quite high (61 per cent.) and in this respect the countryside shows to better advantage than the town, because the urban survey previously mentioned disclosed that only 50 per cent. of the housewives were "Mark" conscious, despite a good deal of propaganda in the cities concerned.

Although nearly half of those who were acquainted with the National Mark had read of it in the newspapers, or had seen it in a shop, an appreciable number had heard of it through the local Women's Institute, which is evidence of the useful work that the Institutes are doing for the better marketing of home produce.

The investigation also revealed that over 80 per cent. of the grocers and greengrocers who were interviewed stocked National Mark products. With the grocers, National Mark canned fruit was easily the most popular product, with canned vegetables second; while among the greengrocers, National Mark fresh vegetables came first, with canned fruit and vegetables second. The National Mark product most often asked for in the greengrocer's shop was fresh tomatoes. Sales of National Mark canned fruit (particu-

MARKETING NOTES

larly strawberries) and vegetables (especially peas) were stated to be on the increase. Canned fruit was the chief National Mark product bought by the housewives who were interviewed, but flour came second (due largely to the demand in Suffolk) followed by canned vegetables. Comparatively few rural housewives buy National Mark eggs; doubtless many of them keep their own hens or purchase their eggs direct from neighbours.

The majority of rural housewives of all classes stated that quality was their first consideration when buying; and of those who do not at present buy National Mark, about 40 per cent. said they would do so in future.

Marketing of Potatoes Act (Northern Ireland), 1934.—An account of the Marketing of Potatoes Act (Northern Ireland), 1928, was given in these notes in the issue of the JOURNAL for March, 1929. The Act provided that, with certain exceptions, persons licensed by the Ministry of Agriculture for Northern Ireland might export potatoes to Great Britain, the Irish Free State or the Isle of Man; and that all potatoes for export to these countries should be inspected and certified as to quality by an officer of the Ministry. Fees for licences and certificates, and penalties for contraventions of regulations were also prescribed.

A Bill amending this Act received the Royal Assent on June 28, 1934, and the Act will come into operation as regards its main provisions on September 1, 1934. In addition to certain minor amendments, the new Act contains two important provisions.

In the first place, it extends the principle of compulsory grading to the home market. The Ministry of Agriculture may make regulations requiring all potatoes marketed in any prescribed market or area of Northern Ireland to be of such standards of quality, to bear a quality mark, and be graded and packed in such ways, as it may prescribe. Different quality standards and different methods of grading and packing may be prescribed for different classes of potatoes. No regulation of this kind, however, is to interfere with the lawful use of private trade marks or brands. Any person contravening these regulations is subject to the same penalties as are provided for in the principal Act as amended by the present Act. Officers of the Ministry of Agriculture duly authorized under the principal Act have their powers of inspection extended to cover the purposes of the present Act, and in particular may enter any market

MARKETING NOTES

or place in any area to which marketing regulations made under this Act apply.

Secondly, the system of issuing export licences prescribed under the principal Act has been amended. All existing licences are to expire when the present Act comes into operation, and all new licences issued thereafter will be renewable annually, expiring on August 31 each year. Licences may also be revoked or suspended on account of the non-compliance of the holder with any condition attached to them, or for any other reason that the Ministry may deem sufficient. The fee payable when a licence is obtained or renewed is to be £5 on each occasion, instead of only £1 on the initial granting of the licence as at present. In addition, a deposit of £15 must be made with the Ministry each time a licence is granted or renewed, as a payment on account of the fees payable for export certificates under the principal Act. Any balance remaining when a licence expires or is revoked is payable to the Exchequer, except in so far as it may be appropriated for defraying the expenses of operating the Act.

Australia: Developments in the Marketing of Butter and Cheese.—The Dairy Produce Act, 1933, a Commonwealth measure that recently came into operation, establishes a revised scheme for the marketing of butter and cheese both by the export of prescribed proportions of the Australian output, and by the control of inter-State trade by a licensing system. Under the eight-year-old Paterson plan, which the new legislation replaces, a levy on the manufacture of butter automatically increased the domestic price, and at the same time provided a fund out of which a bounty was paid on exports of butter. The Paterson plan was a voluntary scheme that did not receive the full support of the industry, and moreover did not embrace farm-made butter. For these reasons, and because of the very large increase in butter exports, the Paterson plan was rapidly losing its effectiveness, and becoming administratively difficult.

The new Act has for its object the maintenance of domestic prices of butter and cheese at such a level as will compensate dairymen for the depressed prices received for export in the world market, and ensures that the producer will take his fair share of the less remunerative export market instead of glutting the home market.

The Commonwealth Government is responsible for the

MARKETING NOTES

determination and enforcement of an export quota, while the States administer the inter-state and internal quotas. The Commonwealth Dairy Produce Equalization Committee, Ltd., which has been established independently by the industry, is officially recognized as the mouth-piece of the industry for the fixing of the domestic price.

The necessary complementary State legislation, establishing separate State Boards, has been passed in the case of New South Wales, Victoria, Queensland and Tasmania, which produce in the aggregate over 90 per cent., and 80 per cent. of the total Commonwealth output of butter and cheese respectively. It is understood that the States of South Australia and Western Australia have more recently agreed to come into the scheme, and that provisional authorities have been appointed to these two States to administer Commonwealth regulations, which have been issued under the Act, concerning inter-State trade licences. In addition, Commonwealth regulations have been issued concerning the poll of producers that must be taken six months after the commencement of the Act. Unless there is a majority vote in favour of its continued operation, the Act will cease to have effect.

The export quota for butter, which may be varied at any time, was fixed by the Commonwealth Minister of Commerce, on the recommendation of the State Boards, at 55 per cent. of production for the month of May, 1934. The domestic price of butter throughout Australia has been fixed by the Commonwealth Dairy Produce Equalization Committee, Ltd., at 140s. per cwt. as against the London price of about 70s. per cwt.

United States of America: Standards of Quality for Canned Goods.—A move in the direction of the compulsory observance by manufacturers, and declaration on labels, of standards of quality for canned goods, was made recently in the United States. As a condition of his approval of the Code of Fair Competition for the Canning Industry, drawn up by the industry under the provision of the National Industrial Recovery Act, President Roosevelt has required that the industry should set up a Committee to co-operate with the National Recovery Administrator, in the formulation of standards of quality for the products of the industry, and to make recommendations within 90 days for the inclusion in the Code of provisions in respect of standards and labelling requirements.

AUGUST ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington.

At the time of writing the main concern over the greater part of the country is the continuing drought. So far the experiences agree very closely with those of 1933, but it is generally believed that the country as a whole has not shown the ill effects of the low rainfall quite so early as it did last year. Two consecutive dry summers have, however, been most unusual in recent years, and this fact tends to aggravate the problem of finding sufficient home-grown food to meet the ordinary winter needs of live stock. Surplus hay stocks were heavily reduced last winter and in the present season the crops of meadow hay in particular have been very light in the southern half of England. There is, therefore, a good deal of speculation as to how far existing hay stocks are adequate and to what extent at this late stage it is possible to augment the normal supplies of roughage. It is not helpful that the crops of spring-sown cereals are generally light in straw, and wheat alone is consistent in being the best cereal crop of the year. Wheat straw, however, is not highly rated as a food stuff, though if it is well harvested animals will take their share. It is at such times as these that the availability of arable crops is particularly useful. Seeds hay crops on the average have given better yields than permanent meadows and this fact added to the present stability in both wheat and beet emphasizes the virtues of the arable policy. Root crops generally have not had a particularly good year thus far. Although in the Fens potatoes and beet have rarely looked better, elsewhere the results are not so good. Equally serious have been the ravages of the turnip flea beetle on turnip and kale crops all over the country. This will still further aggravate winter feeding problems where hay and straw are in short supply.

The main hope at this stage is that rain will restore the growth of grass on pastures and stimulate aftermath so that a second crop of hay can be taken. It is something of a gamble to top-dress with nitrogen at a period when there seems to be no immediate prospect of rain, but the writer has taken the risk. It is sometimes

AUGUST ON THE FARM

urged that the weather is rarely suitable for securing a satisfactory second cut of hay, but this probably means that fuller use could be made of the Scottish system that utilizes tripods or "bosses," around which half-cured hay is stacked. A trial of this system for both hay and cereals was made at Sparsholt in 1932 [see this JOURNAL, April, 1933]. The conclusions arrived at indicated that the system provides a safe method of harvesting fodder, grain and seed crops under practically all weather conditions, and that the quality and weight of hay and lucerne were superior to those obtained by the ordinary method. Whether the use of tripods or frames will ever become general in this country will largely depend on the value placed on quality. There is evidence that this system does produce hay of higher nutritive value, but with most people the main consideration is cost, and it is argued that the cheapest method is to store the hay direct in the stack rather than subject it to a preliminary period of curing around a tripod. This argument probably scores in a year like the present, but a different view-point will probably be taken in a year when the normal method of curing in the field is rendered difficult through wet weather.

An alternative that many are disposed to follow with aftermaths is to convert them into silage, as it is possible to secure quite good results from silage made in stacks.

Corn Harvest.—For the second year in succession an early harvest is in prospect. The indications suggest that spring-sown oats will be ready for cutting before the end of July in the Midlands and South of England. This was the case in 1933, when crops of the February-sown Marvellous oat were ready for cutting in the third week of July and were actually carried to the stack during the last week. Weather conditions, however, play a considerable part in determining the rapidity or otherwise of carrying.

Harvest is no longer the laborious task that it once was. Tractors with power-take-off attachments for fitting to self-binders with a wide end enable large acreages to be cut in a relatively short time. The rapidity of cutting is invariably greater when a dry year has been experienced, for, apart from the shorter growth of straw, there is a smaller acreage of lodged crops. Lodging not only adds to the expense of harvesting in a normal year, but is equally responsible for a loss of grain through bird attack, as well as a lower quality of grain, and therefore there are some compensa-

AUGUST ON THE FARM

tions for a short crop of straw. Unfortunately lodging is usually more pronounced under conditions of high fertility, and it therefore becomes necessary to recognize that the level of fertility in modern husbandry must determine the variety most suitable. In the present year barley is the only crop that has shown signs of lodging under rich soil conditions, and this is not conducive to the production of the best malting samples.

A point of some interest arises with regard to the stage at which cereals should be cut. Since it appears probable that cereal straw will be extensively used for stock feeding this winter, it will be an advantage from this standpoint if oat crops in particular are not allowed to advance too far in ripeness before they are cut.

Stubble Cleaning.—Frequent reference has been made to the desirability of stubble cleaning after harvest, and it becomes specially necessary to make some attempt to bring about the germination of weed seeds that have been abundant in many crops this year. Poppies in particular have been plentiful in many of the arable districts and it is probably the outcome of the very dry period and favourable seeding conditions that were experienced last year. Fortunately there is some evidence that the paring of stubbles does much to encourage the germination of poppy seeds. The main object should be to secure a surface tilth by cultivating with broad shares or tines, but, if full advantage is to be taken of the opportunities, it is almost essential that a tractor should be employed. An early harvest will allow full scope for work of this kind to be undertaken, and it is desirable to appreciate more widely that autumn cleaning goes a long way towards the control of weeds in the following year's root breaks.

Internal Equipment of Cowsheds.—At a time when a good deal of modernization of cowsheds is taking place there is probably no item that is more discussed than the internal fittings. Its importance is relatively great, since not only is the question of cleanliness of milk production involved but also the comfort of the cattle and the maintenance of sound limbs. It must be confessed frankly that many so-called modern sheds have proved distinctly unsatisfactory in use, and therefore an examination of the problems involved may be helpful. To this end the experience accumulated on the Midland College farm can serve as an

AUGUST ON THE FARM

example. A new range of farm buildings was erected about six years ago and included a cowshed that was equipped with tubular fittings and yokes. This shed is a double-range pattern with central milking and cleaning out passage. The single standings were five feet in length and 3 ft. 6 in. wide, and the class of cattle housed are Shorthorns. Concrete flooring was employed throughout and this was specially roughened on the surface to prevent slipping. During the first winter it became necessary to convert the single standings into double standings by removing every other division. This was necessitated by the fact that the cows seemed to be cramped for room and damage was caused to the ribs. It was also observed that the cows seemed to have a better idea of their own stalls on the shed being converted to double standings.

There were, however, some cases of injury from causes not so easily rectified, and for over five years efforts have been made to discover useful information on the points concerned. Two troubles in particular have been pronounced. The first was a tendency for cows to damage their brisket and knees. This has to some extent been remedied by cutting away a portion of the manger front so that a blunt edge was provided and a lower front. The second was the development of enlarged hocks as a result of bruises, and this was specially pronounced with heifers and newly purchased cows brought into the shed for the first time. There were rather contradictory features associated with this. With mature cows it was thought that the standings were too short and it was especially obvious when the cows were resting. Steps were accordingly taken to lengthen the standings by a further 3 to 4 in. This, however, has had no material influence in reducing the tendency to hock trouble, and therefore the yoke method of holding the cattle in the stalls came under review. The yokes are definitely the simplest method of fastening that has been evolved, but here again a certain amount of variation exists with regard to the behaviour of cattle in the yokes. Thus, the first defect observed was that a standard size of yoke is unsuitable and that variations in width are necessary to accommodate cattle with different neck widths. In some instances the fitting of a yoke with a width of 9 in. in place of one 7 in. wide effected an improvement. Some cattle, however, appeared to take a violent dislike to the yoke type of fastener, and found it especially difficult in the

AUGUST ON THE FARM

associated type of standing to get on to their feet in a normal manner after lying down. So marked was this sometimes that the cows either refused to get up at all or otherwise got up on their front feet first.

The next obvious step, therefore, was to discover suitable methods of holding cattle in the stalls without the defects of the yokes. Three different types of fasteners have been employed. The first was the reversion to the old-fashioned rope or chain tie. In practice this has proved comfortable, though it is not so easy to keep strange cattle from fighting each other in the stalls, especially where tubular fittings are employed. The second method was the adoption of what is known as a Dutch system of a central chain in place of the yokes on which a sliding loop is attached and by which the cow is held in position. This, too, has proved to be definitely superior to the yoke, except that it takes longer to fasten and unfasten. The third method consists of a sliding chain attached to both sides of the tubular stall and attached in the centre is a further chain tie. Thus the cattle are centrally held and at the same time have that freedom that is associated with the ordinary type of chain fastener. It is probable that in this type of stall this is the best method of securing cattle, though it is worthy of observation that these fasteners should not be too heavy on the neck, and for this reason a rope or leather fastener is preferable to a chain. These also have the advantage of being easily severed by a knife in case an accident necessitates the quick release of a cow from a stall.

In fairness to the yoke fasteners it should be explained that there have been cows in the shed for five consecutive winters that have never given the slightest indication of trouble, with the possible exception of slight swellings in the brisket region. Similarly the tubular types of cowshed equipment as such are not to be condemned, but there is definite evidence that the yoke fittings are likely to give rise to troubles in certain instances. In the writer's opinion an alternative form of tie should be available. In support of this contention is the experience gained with a new cowshed erected three years ago employing the old-fashioned side ties with a standing length of 5 ft. 6 in. Four different types of flooring have been utilized, viz., concrete, brick on edge, cork-asphalte, and rubber. No trouble of any kind has been experienced, but the concrete flooring, which is so frequently condemned on the grounds of coldness, in

AUGUST ON THE FARM

this case was properly insulated by an under layer of hard-core or broken brick. The least satisfactory standing, from the standpoint of durability, was that of cork-asphalte bricks. These should not be confused with the new asphalte tiles known as "Monopavets" that are now being advocated as a suitable flooring material. It is too early to speak with confidence concerning the wearing and other properties of these tiles. Their chief defect is probably that of being slippery when they are wet, though this is not so marked where the tiles are suitably grooved. They are, however, definitely warmer than concrete and can be very easily laid over existing concrete floors. Another equally interesting rubber material is now being used by the Dunlop Rubber Company for fixing over existing concrete floors, and of special importance is the fact that the fronts of concrete mangers can be padded with this material. After a twelve months' experience of rubber mats and flooring, there has been no sign that any injury is caused to the feet—a suggestion that is sometimes made because rubber shoes in human experience are said to "draw" the feet.

The Proven Bull.—Visitors to the recent Royal Show at Ipswich were provided with a vivid demonstration of the progeny test as a means of evaluating the worth of a sire in a dairy herd in connexion with the Education Exhibit. The female progeny of three directly related bulls representing three generations—grandfather, father and son—were exhibited to demonstrate that a bull's real worth does not depend on the milking performance of his dam and sire's dam, but on the performance of his daughters compared with their dams. This is by no means a new idea, since both scientific workers and experienced breeders have recognized for many years past that too many bulls are slaughtered before their true value is appreciated. It is, nevertheless, necessary to stress the desirability of giving every bull an opportunity to express himself as fully as possible through his progeny, and, contrary to commonly accepted ideas, bulls can be maintained at service for a longer period than they usually are, provided they have been properly managed. Thus, in the Ipswich exhibit the three bulls demonstrating the progeny test were respectively 16, 10 and 6½ years old. In breeding practice there are quite a number of notable examples of first-class herds that have been built up through the services of mature bulls. This fact alone would appear to give the necessary support to

AUGUST ON THE FARM

an extension of the practice of retaining sires until a sufficient number of their progeny have had time to complete their first lactation. One has to recognize, however, that there are limitations to the practice. The most serious is that in the majority of instances herds are of limited size and do not justify the keeping of several bulls. The question of temper also frequently arises, since it is not always possible on small farms to provide conditions that are ideal for maintaining the bulls in the best of tempers. The greatest sphere of usefulness for a progeny-tested bull is in a herd that is devoted to the breeding of young bulls for use in commercial and other herds. Indeed, pedigree breeders generally are now paying close attention to this subject, and the concentration of progeny-tested " blood " is a feature of many of our best herds.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended July 18				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	7 18d	7 18d	7 18d	7 18d	10 2
" " Granulated (N. 16%) ..	7 18d	7 18d	7 18d	7 18d	9 9
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20.6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium cyanamide (N. 20.6%)	7 5s	7 5s	7 5s	7 5s	7 0
Kainit (Pot. 14%) ..	3 6	3 0	2 17	3 0g	4 3
Potash salts (Pot. 30%) ..	5 4	5 1	4 17	5 0g	3 4
" " (Pot. 20%) ..	3 15	3 9	3 6	3 10g	3 6
Muriate of potash (Pot. 50%)	9 8	9 1	8 15	9 2g	3 8
Sulphate " " (Pot. 48%)	10 12	10 7	10 0	10 7g	4 4
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26-27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16k	3 6
" " (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	7 15	6 17	6 15f	6 7	..
Steamed bone-flour (N. 4%, P.A. 27½-29½%) ..	5 5	5 12	5 15f	5 7	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 5 tons the price is 12s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails; southern rails, 12s. 3d. extra.

NOTES ON FEEDING

W. B. MERCER, M.C., B.Sc. (Principal), and Colleagues.
Cheshire School of Agriculture, Reaseheath, Cheshire.

Pasturage.—July has changed the face of England's green and pleasant land. Whether or not the early failure of pastures is to be regarded as a disaster depends upon the point of view. From the narrow standpoint of the milk producer, with a contract to be filled at prices independent of his own output, it is a serious drawback that supplementary feeding of the herd must be started six weeks earlier than usual. A cheesemaker, whose every outlet is blocked by the surplus of the milk producer, may be excused for regarding drought as a blessing in disguise.

There is no escape from cake feeding of dairy stock in a dry July: not altogether on account of immediate results, but because of ultimate effects. No doubt it was a Martha cumbered of children's clothes who first observed that a stitch in time saves nine. It might well have been a dairy farmer anxious about daily milk yields; for it is easier to prevent a cow's yield from falling than it is to restore the yield to a satisfactory level once it has been allowed to fall. Relatively, a 4-gallon cow is a plastic subject; a 2-gallon cow is not. In a dry summer, August and September yields reflect July management quite as much as that of the later months. This year it has been advisable to resort to supplementary feeding *before* yields have proclaimed food shortage. On the heavily-stocked pastures of the north-west, the problem of the quality of late summer grass has paled before that of quantity—cows ran short not only of their theoretical requirements of digestible protein, but short of mere fill-belly bulk also. For once in a way, therefore, bespectacled science and horny-handed practice have gazed at the same field and seen the same mental picture. Normally, the small dairy farmer tends to look upon cake feeding as a means of keeping more cows, while the scientist regards it as a means of enabling the individual cow to maintain her full yield: this year no logician could quarrel with either view. Fortunately, cake-feeding of dairy cows is not a desperate matter—maize, whether in the form of natural meal or flaked, decorticated

NOTES ON FEEDING

earlnut cake, sugar-beet pulp and palm kernel cake, are all purchasable at less than 1s. 6d. per unit of starch equivalent; and though it is probable that the ration ought, this year, to be "balanced" in the same manner as a winter mixture for milk production, the range of cheap foods is sufficient to allow of this being done. Sugar-beet pulp has been particularly attractive in the circumstances by reason of its bulk—a strange reason to obtain in midsummer.

Feeding Stock.—The case for cake-feeding of cows is fairly straightforward. It can be expressed mathematically; the return obtainable from a given expenditure can be assessed quite closely. It is otherwise with feeding stock in which the imponderable factors that make up "finish" play so large a part. There are, indeed, few available statistics bearing on the rates at which cattle feed during a grazing season. Certain records, taken a few years ago at Reaseheath, suggest that the response to differential pasture values may be almost as great as with dairy stock. A bunch of Hereford steers turned on to good pasture in May put on 4 lb. per head per day for the first six weeks. In the late summer, the growth-rate fell to little more than 2 lb. per head per day. Growth-rate, however, is only a partial criterion. Good feeding-stock grow and fatten simultaneously; live-weight statistics are but a poor guide to dead weight. Half-finished cattle, as the saying goes, "do not kill." Nor can selling values be assessed from live weights—nothing but experience can tell the grazier what a beast may make in a given market, since selling values depend so much upon the killing weight and the quality of the carcass. Aberdeen fat-stock prices are not, as the foreigner visiting our shores naively supposed, attributable to the spendthrift habits of the Aberdonians, but to the quality of the beef offered. It is not therefore possible to draw up a profit and loss account for the finishing of cattle by adding up costs and multiplying anticipated live-weight gains by a fixed sum per pound. One can but argue, on general grounds, that top prices are attainable only for high quality, that quality is attainable only in the finished animal, and that finish is attainable only by liberal feeding.

It is, of course, well known that the rate of live-weight increase tends to fall as animals approach prime condition, so that the costs of the finishing stones become disproportionately high. Nevertheless, if profits can be made at all in feeding, they will be made on finished beasts. In July,

NOTES ON FEEDING

therefore, the grazier must make up his mind which animals are to be finished on grass, which to be kept for yard feeding; corn or cake for the former is essential. A moderate ration over a longish period is in general to be preferred to a heavy ration for a short time. Oats, barley, maize and sugar-beet pulp are probably the most suitable concentrates.

Pig-grading Problems.—Pig grading has brought into the realm of economics a number of problems hitherto of little more than academic interest. There is a remarkable unanimity among writers on the subject as to effect of breeding on grading results, and, as yet, no doubting Thomas has arisen to demand proofs. This is fortunate, because there are no proofs. As yet, also, little information is available as to the effects of feeds and methods of feeding on carcass quality. Interest in the latter question has been stimulated of late by certain noteworthy demonstrations conducted by commercial interests in the pig-feeding areas. In one such demonstration, recently inspected by the writers, some 200 pigs were being fed in a house of Swedish pattern, on a mixture of crushed cereals, with a small addition of a proprietary compound stated to be rich in vitamins and minerals; the water supply was cut down to little more than the weight of the meals. There was remarkably little dung; the passages were nearly dry; there were no flies and scarcely a trace of that sensory factor by which pigs ordinarily proclaim their presence. Beyond question, pigs fed on dry meals, with a restricted water supply, require singularly little labour. Exactly how far the water supply can humanely be reduced is not quite clear. Dr. Crowther, it may be recalled, in an experiment some years ago found that the growth-rates of pigs fed on water and meals in the proportion of 2 to 1 were not significantly different from those of animals receiving 50 per cent. more liquid. In a small trial, conducted last winter at Reaseheath, pens receiving water (or whey) and meal in the proportion of $1\frac{1}{2}$:1 grew normally and displayed no signs of suffering from shortage of liquid. Presumably, weather conditions enter into the question, but there seems little doubt that most slop-fed pigs get more liquid than they need—and quite possibly more than they want.

Rations for Baconers.—New factors have also to be considered in compounding rations. Barley meal, for many

NOTES ON FEEDING

years the basis of fattening rations, is now relatively dear, while maize is cheap. Some of the protein-rich vegetable foods, notably earthnut cake, are cheaper per unit of starch equivalent than barley. Scientific feeding-standards are based on the known requirements of the pig at different ages; a young pig requires proportionately more protein than an old pig; and as protein-rich foods have in general been dearer than farinaceous foods, the pig feeder served his scientific god and mammon both in widening the nutritive ratio of the food as the animal grew older. At present there is nothing to be gained financially by such alteration. A ration such as—

Barley Meal	..	..	20 parts.
Maize Meal	..	..	20 "
Thirids	..	..	40 "
Decorticated Earthnut Meal	..	..	20 "

with 16 per cent. of digestible protein is cheaper than

Barley Meal	..	..	50 parts
Maize Meal	..	..	20 "
Thirids	..	..	20 "
Decorticated Earthnut Meal	..	..	10 "

with 11 per cent. of digestible protein.

On the other hand, there may be some gain in feeding to a big pig a ration with a protein proportion somewhat in excess of its theoretical requirements. The commonest fault discovered by grading is excess of backfat, and one cause of excess of backfat is undoubtedly the use of a ration excessively rich in starchy foods. All things considered, a partial displacement of barley meal by maize meal or flakes, and a rather more generous allowance of protein-rich foods than has hitherto been economical seem sound practice at the moment.

Growth-rate and Grading. — Growth-rate has in the past been commonly accepted as a safe criterion in judging feeding results. Many feeders now incline to the belief that the most rapid growers tend to give poorer grading results than animals that feed more slowly. Records have been kept at Reaseheath of the growth-rates of all pigs sold under the Marketing Scheme, and as the buyers have been good enough to supply individual grading reports it is possible to correlate the two sets of figures as follows:—

	Grades.				
	A	B	C	D	E
No. of pigs	13	24	16	6	1
Average growth-rate (lb. live wgt. incr. per week of life)	6.5	6.6	6.7	7.2	8.8

NOTES ON FEEDING

These results are quoted with some reserve, since the numbers are small, and the pigs were not all graded by the same man. Nevertheless, the figures bear out the impression that a casual inspection of a feeding pen is apt to convey. The ideal pig described for our guidance by curers is no doubt the type likely to grade well—an animal of manifest quality—but he shades off by easy stages into the kind facetiously described as the greyhound type; and even at his best he is not the one that the feeder would choose as the “best doer.”

FARM VALUES OF FEEDING STUFFS

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	5 19
Maize	78	7.6	4 14
Decorticated ground-nut cake	73	41.3	6 0
„ cotton cake .	68	34.7	6 15

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.48 shillings, and per unit protein equivalent, 0.87 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1933, issue of the Ministry's JOURNAL, p. 784.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	5 15
Oats	60	7.6	4 15
Barley	71	6.2	5 10
Potatoes	18	0.8	1 7
Swedes	7	0.7	0 11
Mangolds	7	0.4	0 11
Beans	66	19.7	5 15
Good meadow hay .	37	4.6	2 19
Good oat straw ...	20	0.9	1 10
Good clover hay ...	38	7.0	3 2
Vetch and oat silage	13	1.6	1 1
Barley straw	23	0.7	1 15
Wheat straw	13	0.1	0 19
Bean straw	23	1.7	1 16

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d. net.

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Protein per unit starch equiv.	Protein per lb. starch equiv.	Protein equiv.
Wheat, British	£ 5 15	0 8	£ 5 7	72	1 6	0.80	9.6
Barley, Argentine	6 3	0 8	5 15	71	1 7	0.85	6.2
" Persian	5 10*	0 8	5 2	71	1 3	0.76	6.2
" Russian	6 3	0 8	5 15	71	1 7	0.85	6.2
Oats, English white	6 17	0 9	6 8	60	2 2	1.16	7.6
" black and grey	6 17	0 9	6 8	60	2 2	1.16	7.6
" Scotch White	7 5	0 9	6 16	60	2 3	1.21	7.6
" Canadian No. 2 Western	7 5	0 9	6 16	60	2 3	1.21	7.6
" mixed feed	6 7	0 9	5 18	60	2 0	1.07	7.6
" Argentine	7 2	0 9	6 13	60	2 3	1.21	7.6
" Chilean	6 18	0 9	6 9	60	2 2	1.16	7.6
" Russian	6 5†	0 9	5 16	60	1 11	1.03	7.6
Maize, Argentine	4 17	0 7	4 10	78	1 2	0.62	7.6
" Gal. Fox	4 12†	0 7	4 5	78	1 1	0.58	7.6
" Russian	4 12†	0 7	4 5	78	1 1	0.58	7.6
Beans, English Winter	6 08	0 16	5 4	66	1 7	0.85	19.7
Peas, Indian	8 10†	0 14	7 16	69	2 3	1.21	18.1
" Japanese	19 15†	0 14	19 1	69	5 6	2.95	18.1
Dari	6 0†	0 8	5 12	74	1 6	0.80	7.2
Milling offals—Bran, British	5 2	0 15	4 7	43	2 0	1.07	9.9
" broad	5 7	0 15	4 12	43	2 2	1.16	10
Middlings, fine imported	5 5	0 12	4 13	69	1 4	0.71	12.1
Weatings	5 7	0 13	4 14	56	1 8	0.89	10.7
" Superfine	6 7	0 12	5 15	69	1 8	0.89	12.1
Pollards, imported	4 15	0 14	4 1	62	1 4	0.71	11
Meal, barley	7 12	0 8	7 4	71	2 0	1.07	6.2
" grade II	6 17	0 8	6 9	71	1 10	0.98	6.2
" maize	5 15	0 7	5 8	78	1 5	0.76	7.6
" germ	5 15	0 11	5 4	79	1 4	0.71	8.5
" locust bean	7 0	0 5	6 15	71	1 11	1.03	3.6
" bean	7 15	0 16	6 19	66	2 1	1.12	19.7
" fish	16 0	2 1	13 19	59	4 9	2.54	53
Maize, cooked flaked	6 0	0 7	5 13	84	1 4	0.71	9.2
" gluten feed	5 12	0 12	5 0	76	1 4	0.71	19.2
Linseed cake, English, 12% oil	9 15	1 0	8 15	74	2 4	1.25	24.6
" " " 9% "	9 7	1 0	8 7	74	2 3	1.21	24.6
" " " 8% "	9 2	1 0	8 2	74	2 2	1.16	24.6
" " " 6% "	9 7‡	1 0	8 7	74	2 3	1.21	24.6
Soya-bean cake, 5½% oil	6 15‡	1 8	5 7	69	1 7	0.85	36.9
Cottonseed cake—English, Egyptian seed, 4½% oil	4 5	0 17	3 8	42	1 7	0.85	17.3
" " Egyptian, 4½% "	4 0	0 17	3 3	42	1 6	0.80	17.3
" " decorticated, 7% "	6 15†	1 8	5 7	68	1 7	0.85	34.7
" meal, decorticated, 7% "	6 12†	1 8	5 4	68	1 6	0.80	34.7
Coconut cake, 6% oil	6 0	0 18	5 2	77	1 4	0.71	16.4
Ground-nut cake, 6-7% oil	5 12*	0 18	4 14	57	1 8	0.89	27.3
" " " decor., 6-7% oil	6 10	1 7	5 3	73	1 5	0.76	41.3
" " " imported, decorticated, 6-7% oil	5 10	1 7	4 3	73	1 2	0.62	41.3
Palm-kernel cake, 4½-5½% oil	5 17†	0 12	5 5	73	1 5	0.76	16.9
" " meal, 4½% oil	5 17†	0 12	5 5	73	1 5	0.76	16.9
" " meal, 1-2% oil	5 7	0 12	4 15	71	1 4	0.71	16.5
Feeding treacle	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale	5 0	0 11	4 9	48	1 10	0.98	12.5
" " " porter	4 12	0 11	4 1	48	1 8	0.89	12.5
Dried sugar-beet pulp (A)	4 12	0 5	4 7	66	1 4	0.71	5.2

(a) Carriage paid in 4 and 5 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

In these instances manurial value, starch equivalent and protein equivalent are provisional.

to 1

1924, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 24, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is $\text{rs. } \frac{9}{24}$. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is $\text{rs. } \frac{9}{24 \times 22.4}$. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, $\text{rs. } 0.4$; P, $\text{rs. } 0.4$; K, $\text{rs. } 0.4$; S, $\text{rs. } 0.4$.

MISCELLANEOUS NOTES

Milk Recording of Goats

GOATS are recorded under the same conditions as cattle and by the same Societies. The British Goat Society offers a medal annually for the goat obtaining the highest recorded yield, provided this is not less than 3,000 lb. Goats that have been certified as yielding not less than 2,000 lb. during the recorded year are entitled to the prefix R2, those yielding not less than 3,000 lb. to R3, the numeral increasing by a unit for each 1,000 lb. of milk. Since the adoption of this standard the number of goats that qualified up to October 1 last is as follows:—

R5	..	..	..	1
R4	..	..	..	13
R3	..	..	..	81
R2	..	..	..	247

The following is a comparative statement of the annual yields of goats officially recorded for the full year during the past decade:—

Year	No. of Goats Recorded		Average Yield of Goats Recorded			Maximum. Yield	
						lb.	oz.
1923-24	..	101	..	1,654	14	..	4,125 0
1924-25		121		1,728	3		3,551 12
1925-26		121		1,828	4		4,236 4
1926-27		132		1,839	13		4,464 0
1927-28		146		1,877	4		4,343 1
1928-29		139		1,956	9		4,066 8
1929-30		158		2,010	0		5,050 15
1930-31		141		1,837	5		4,140 14
1931-32		123		1,929	4		4,795 0
1932-33		164		2,083	5		4,935 4

The record annual yield for each breed officially recorded in this country now stands as follows:—

<i>Anglo-Nubian</i>	..	..	R2	ETHERLEY KONKEY Q*Q*Q* (A.N 1947)
				Yield: 2,680 lb. 0 oz (Year 1929-30)
<i>British</i>	..	..	R5	Champion SPRINGFIELD PRECOCITY Q*Q*
				(H.B.7588)
				Yield: 5,050 lb. 15 oz. (Year 1929-30)
<i>British Alpine</i>	..	..	R4	DIDGEMERE DRUIDESS** (B.A.64)
				Yield: 4,067 lb. 2 oz. (Year 1929-30)
<i>British Saanen</i>	..	..	R4	Champion MOSTVN MARIGOLD Q*Q*
				(B.S.165)
				Yield: 4,935 lb. 4 oz. (Year 1932-33)
<i>British Toggenburg</i>	..	..	R3	LAYLAND PEARL** (B.T.52)
				Yield: 3,063 lb. 13 oz. (Year 1929-30)
<i>English</i>	..	..	..	ELFFYE OF WEALD (E.7)
				Yield: 1,539 lb. 8 oz (Year 1929-30)

MISCELLANEOUS NOTES

<i>Saanen</i>	R ₄ WONDERSTRIKE Q*Q* (S.25)
	Yield: 4,464 lb. 0 oz. (Year 1926-27)
<i>Toggenburg</i>	R ₃ SANDHILL NERINE* (T.574)
	Yield: 3,012 lb. 5 oz. (Year 1929-30)

It will be seen that the record is held by Ch. SPRINGFIELD PRECOCITY, which gave an average yield of 13 lb. 13 oz. a day during the recorded year 1929-30.

A new record yield for twenty-four hours has been created by Ch. FELTHAM FRISKY Q*Q*Q*Q*Q*, which gave a yield of 21 lb. 10 oz. at the Oxfordshire Agricultural Society's Show held at Henley-on-Thames on May 23 last.

National Poultry Institute Scheme

At the recent National Poultry Parliament, held at Eastbourne, the Ministry's Poultry Commissioner, Mr. P. A. Francis, presented the annual statement of the Department on the progress during the past year of the work of the various sections of the National Poultry Institute scheme. This included a brief account of the educational and experimental work for which the National Institution of Poultry Husbandry is responsible, and a statement of the progress made in the investigation of poultry diseases at the Ministry's Veterinary Laboratory, Weybridge. Professor Punnett's research work on the inheritance of fecundity in poultry and the development of the new Cambar breed (which is sex-linked within itself) were noticed, as well as Mr. Halnan's investigational work on poultry nutrition. The statement concluded with a brief account of the experiments in poultry breeding for egg production at the Northern Breeding Station, Reaseheath, and the Southern table poultry experimental work at Wye.

Copies of the statement may be obtained free of charge on application to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

The Jones-Bateman Cup for Research in Fruit-Growing

IN 1920 Miss L. Jones-Bateman of Cae Glass, Abergele, presented to the Royal Horticultural Society a valuable silver-gilt replica of the Warwick Vase to be used for the encouragement of fruit production. It has been decided to offer this triennially for researches in the growing of hardy fruits, figs, grapes and peaches in the open or under glass. Candidates for the 1934 award should submit

MISCELLANEOUS NOTES

accounts of their work by October 31 next. The work dealt with must have been carried out in the United Kingdom mainly during the past five years.

The Cup will be held for three years by the successful candidate who must give a bond for its safe return, and on its relinquishment the holder will receive a commemorative gold medal, and will remain eligible to compete on the next or any succeeding occasion. Of the three assessors two will be appointed by the Royal Horticultural Society and one by the National Farmers' Union, and they will report to the Council of the Royal Horticultural Society upon the originality and comparative potential value to the fruit-growing industry of the work of the candidates. Communications should be addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, London, S.W.1.

The Agricultural Index Number

The June index number of the prices of agricultural produce at 110 (the corresponding month of 1911-13=100) was 2 points below the previous month, but was 10 points higher than in June, 1933. Higher prices were realized during the month under review for wheat, oats, eggs and hay, but these increases were more than offset by the decreases which occurred in barley, fat sheep and pigs, cheese, potatoes and wool.

Monthly index numbers of prices of Agricultural Produce.
(Corresponding months of 1911-13=100.)

Month.	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	108
April	146	137	123	117	105	111
May	144	134	122	115	102	112
June	140	131	123	111	100	110
July	141	134	121	106	101	—
August	152	135	121	105	105	—
September	152	142	120	104	107	—
October	142	129	113	100	107	—
November	144	129	112	101	109	—
December	143	126	117	103	110	—

Grain.—At 5s. 4d. per cwt. the average for wheat showed a rise of 8d. and the index appreciated by 8 points to 67. If allowance is made for the "deficiency payment" under the Wheat Act, 1932, the index would be increased to approximately 126, the effect of which would be to raise

MISCELLANEOUS NOTES

the general index for agricultural produce from 110 to 114. Barley decreased further by 5*d.* per cwt. and at 7*s.* 1*d.* per cwt. was 4 per cent. cheaper than in the base period compared with 2 per cent. in May. The average for oats at 6*s.* 3*d.* per cwt., however, was 3*d.* above the previous month and the index 2 points higher at 83.

Live Stock.—There was little alteration in the average price of second quality fat cattle, but, as a slight advance occurred in the pre-war period, the index was one point lower at 94. Fat sheep cheapened by 1½*d.* per lb. and the index depreciated 12 points to 138, while the indices for baconers and porkers were both reduced 7 points to 110 and 113 respectively, bacon pigs averaging 10*d.* and porkers 1*s.* per score lb. less than in May. A small rise was noticeable in the prices of dairy cows, and the index was one point higher at 101, but store cattle averaged 7*s.* per head less and the index fell one point to 87. Store pigs and sheep also sold at lower rates, but as proportionately greater declines occurred in June, 1911-13, the relative index numbers at 135 and 109 were one and six points higher.

Dairy and Poultry Produce.—The average of the wholesale contract prices for the sale of milk during June was the same as in May, and the index was unaltered at 162. Butter cheapened by about ¼*d.* per lb., but as a proportionately greater reduction took place in the pre-war period the index advanced 2 points to 87. Eggs were nearly 2*d.* per dozen dearer than in May, and with a rise in the index of 11 points the level was precisely the same as in the pre-war years. Both fowls and ducks were cheaper, but whereas the index for the former declined, that for ducks was one point higher. The average for dead poultry was 126 as against 129 in May.

Other Commodities.—Quotations for potatoes continued to decline during June, and as the pre-war tendency during this period was upward, the index at 82 was 8 points less than in the previous month. Hay, however, was again dearer, and the combined index was 5 points higher at 88. A further decline occurred in the price of wool and the index fell 7 points to 82. Black cherries marketed during the latter part of the month realized nearly double the pre-war price, while strawberries averaged 50 per cent. more, but gooseberries were very little dearer.

MISCELLANEOUS NOTES

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1932	1933	1934			
	June	June	Mar	April	May	June
Wheat	80	80	58	57	59	67
Barley	93	94	111	103	98	96
Oats	107	77	87	84	81	83
Fat cattle	118	95	99	95	95	94
„ sheep	107	114	118	128	150	138
Bacon pigs	91	97	127	125	117	110
Pork „	91	96	131	126	120	113
Dairy cows	116	104	101	103	100	101
Store cattle	115	94	86	84	88	87
„ sheep	98	83	91	95	103	109
„ pigs	85	106	143	137	134	135
Eggs	102	102	89	99	89	100
Poultry	132	132	126	119	129	126
Milk	137	138	141	168	162	162
Butter	96	91	84	91	85	87
Cheese	153	121	116	117	123	108
Potatoes	213	80	97	89	90	82
Hay	69	69	81	80	83	88
Wool	57	63	98	96	89	82

Revised index numbers due to Wheat Act payments.

Wheat	—	124	135	132	126	126
General Index	—	104	113	117	117	114

Advisory Leaflets

SINCE the date of the list published in the April, 1934, issue of this JOURNAL (p. 12), the undermentioned Advisory Leaflets have been issued by the Ministry:—

- No. 13. The Apple Sawfly. (Revised.)
- No. 65. The Magpie Moth. (Revised.)
- No. 96. The Apple Sucker. (Revised.)
- No. 197. Woodpeckers.
- No. 200. The Use of Seaweed as Manure.
- No. 201. The Landrail.
- No. 202. Actinomycosis and Actinobacillosis in Cattle
- No. 203. Leaf Scorch, Glassiness and Bitter Pit of Apples
- No. 204. The Die-Back Disease of Gooseberries
- No. 205. Apple Mildew.
- No. 206. The Rhododendron Bug.
- No. 207. Powdery Mildew of the Vine
- No. 208. The Starling.
- No. 209. The Swallow, the Martins, and the Swift.
- No. 210. The Lapwing.
- No. 211. The Barn Owl.
- No. 213. The Wagtails.
- No. 214. Lamb Dysentery.
- No. 215. Gooseberries.

APPOINTMENTS

Copies of any of the above-mentioned leaflets can be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Sale Offices of that Department at Edinburgh, Manchester, Cardiff and Belfast, price 1d. each net (1½d. post free), or 9d. net per doz. (10d. post free).

Single copies of not more than 20 leaflets can, however, be obtained, free of charge, on application to the Ministry. Further copies beyond this limit must be purchased from H.M. Stationery Office, as above.

A selected list of the Ministry's publications, including leaflets, on agriculture and horticulture can be obtained free and post free on application to the Ministry.

Enforcement of Minimum Rates of Wages.—During the month ending July 14, 1934, legal proceedings were taken against three employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.	Court	Fines imposed.	Costs allowed	Arrears of wages ordered.	No. of workers involved.
Lancashire ...	Leyland ...	£ s. d. 2 0 0	£ s. d. 1 0 0	£ s. d. 30 0 0	1
Lancashire ...	Wigan ...	•	—	—	1
Yorks, W.R. ...	Leeds ...	—	0 8 0	14 2 9	1
		£2 0 0	£1 8 0	£44 2 9	3

* Case dismissed.

Following an investigation under the Agricultural Wages (Regulation) Act, 1924, an interesting development occurred recently. The investigation showed that one of the workers on a farm had been paid at less than the prescribed rates of wages, and that arrears were due to him amounting to £23. This sum was collected from the farmer by the Ministry and remitted to the worker. The farmer then demanded its return to him by the employee under threat of dismissal. The worker, after first agreeing to repay the money, refused to do so and was thereupon dismissed from his employment and ordered to vacate his cottage. The farmer was subsequently prosecuted for demanding money with menaces and was committed for trial at the Assizes, where he was convicted and fined £75.

APPOINTMENTS

Department of Scientific and Industrial Research

Mr. E. Barnard, D.S.O., M.A., Assistant Director, since 1931, of Food Investigation in the Department, has been appointed Director of Food Investigation in succession to the late Sir William Hardy.

NOTICES OF BOOKS

Mr. F. Kidd, M.A., D.Sc., engaged on Food Investigation work at the Low Temperature Research Station, Cambridge, since its establishment in 1922, has been appointed Superintendent of the Station in succession to the late Sir William Hardy.

County Agricultural Educational Staffs

ENGLAND

Cheshire.—Mr. E. Skillman, B.Sc., has been appointed Assistant Lecturer in Horticulture, *vice* Mr. L. F. Clift, N.D.H.

Surrey.—Miss M. J. Carter, B.Sc.(Agric.), N.D.P., has been appointed Adviser in Poultry-keeping, *vice* Miss E. E. Kidd, F.B.S.A.

Miss R. M. Ware has been appointed Assistant Poultry Instructor, *vice* Miss N. C. Butchart, N.D.D., B.D.F.D.

Miss L. M. Cookman has been appointed Manager of the County Egg-Laying Trials, *vice* Miss R. M. Ware.

WALES

Glamorganshire.—Mr. A. B. Turnbull, B.Sc., has been appointed Instructor in Agricultural Economics, *vice* Mr. E. L. Harry, M.Sc.

NOTICES OF BOOKS

The Young Man in Farming. By A. K. Getman & P. W. Chapman. Pp. ix + 216. (London: Chapman & Hall Ltd. New York: John Wiley & Sons Inc. 1933. Price 10s. 6d.)

The instructional literature relating to British agriculture has a gap that ought to be filled at no distant date; the student of agriculture needs a reasoned story of what is behind education for his vocation, of the help derivable from science, of his place in agricultural history, of his powers and responsibilities as member of a local and national community. Pending the arrival of an account of conditions in our own country, and wholly suitable for British youth, this volume is of real interest. Its title is attractive, and it contains much suggestive material, indicating what is at the back of crop and stock production, what must be known and done to ensure use rather than abuse of natural materials and forces, and how youth may prepare for the fray and meet responsibility. The contributions, however, are in two veins, and differ somewhat in quality. Nevertheless, the book is up to date, and of undoubted utility in indicating American ideas and conditions, and it will do our young men good to know about these. The reviewer, however, feels that we shall have to wait for our own story, and hopes it will come, not to order but spontaneously, and written with knowledge, insight and inspiration.

Pflanzenbaulehre für Landwirte (*Crop Husbandry for Farmers*). By Professor Dr. A. Zade. Pp. xi + 533, and 72 figs. (Berlin: Paul Parey, 28 and 29 Hedemannstr., S.W.11. 1933. Price RM. 24.80.)

In the preface to this informative volume, Professor Zade makes the significant statement that since the Great War the agricultural situation in Germany has steadily grown worse from year to year, but that throughout this time the farmer has steadfastly refused to abandon hopes of better days to come. There must be some factor in farming that compels optimism even in times of depression, for the attitude of the British farmer has been the same in circumstances of very like nature. It will be of interest at some future date to compare the results of the efforts of the present regime in Germany to improve the conditions of agricultural life, with those that follow from recent legislative attempts in this direction in Britain.

Professor Zade puts forward his new book as a contribution to the

NOTICES OF BOOKS

solution of some of the difficulties of German farmers. He states in the preface that recent publications dealing with the cultivation of agricultural crops have been either voluminous text-books or smaller productions that have scarcely sufficed to enable the student to gain a real insight into the fundamental principles of this many-sided subject. The present volume is designed to take a middle course. It is intended to meet the needs of the educated farmer, bringing within his reach the practical and scientific knowledge that is essential to successful crop cultivation.

The first section surveys plant life in the wild and cultivated forms, besides giving an explanation of the idea of species and an introduction to the problem of the furtherance of the interests of crop husbandry by the State. Then follows a detailed description of all the plants of agricultural importance, the value of these sections being greatly enhanced by the numerous excellent illustrations that form a praiseworthy feature of the book. The treatment of crops falls into seven main sections. The first two sections deal with the numerous crops grown for grain and seed, and include rye, wheat, barley, oats, maize, millet, buckwheat, peas, lentils, beans, lupins, soya beans, rape, mustard, linseed, poppy seed, sunflower seed, caraway, etc. All these crops are dealt with in the most generous detail, the general treatment being under the following headings:—agricultural; distribution; derivation and habitat; botanical characteristics; varieties; manuring and soil preparation; details of sowing; care of crop; harvesting and yield. Other sections deal equally adequately with the grasses and all the different forage crops, with roots, including sugar-beet, and tubers, and with such special crops as tobacco, flax, hops and chicory.

The volume has naturally been designed to meet primarily the special requirements of the German agriculturist, but its clarity of plan, its comprehensive scope and the careful regard paid to modern advances of knowledge in this domain should render it also a valuable work of reference for agricultural students in this country.

The Weekly Weather Report (February 28, 1932—February 25, 1933). Vol. XLIX. Pp. 72. (His Majesty's Stationery Office. Price 7s. 6d.)

This publication, issued by the Meteorological Office, contains data relating to temperature, rainfall and sunshine for each week in the twelve months from the beginning of Spring, 1932, to the end of the following Winter period. The tables are arranged so that the whole sequence of data (with deviations from the normal) for a single station occupy one page. The principal tables give data in this form for 57 selected stations, well distributed over the British Isles. Other tables show the normal values for the twelve climatological districts of the British Isles and the deviation from normal in each week and in each of the four seasons. The tables show that the period under review gave a deficiency of sunshine and an excess of rainfall in nearly all districts. The Spring of 1932 was particularly wet in the Midlands and Eastern districts of England and Scotland. The Summer, though warmer than the normal, was markedly deficient in sunshine.

Wheat in Great Britain. By J. Percival, M.A., D.Sc. Pp. 125 and 63 figures. (Obtainable from the Author, "Leighton," Shinfield, Reading. 1934. Price 10s. 6d.)

There is evidence that wheat has been grown continuously in this country since 2,000 B.C., and Dr. Percival gives an interesting and concise account of wheat growing in all its aspects from the neolithic age to the present day. The extent to which factors such as soil, climate, etc., affect growth is dealt with; also how far improvements in cultivation, sowing, manuring and variety have influenced yield. The wheat crop has been grown to a greater or lesser extent in every part of Great Britain, and the distribution of the crop is discussed

NOTICES OF BOOKS

in a chapter well supplemented with relative statistical tables.

The author indicates the principles by which differentiation of wheats of the same botanical variety can be made, and different forms or strains identified. He outlines the attempts to secure improved wheats by selection of plants from a "pure" or "single" line; by mass selection and pedigree selection, and by hybridization. An explanation of the origin and signification of the terms "pure" and "single" in this connexion, is included.

A valuable part of the work is the description, accompanied by excellent illustrations, of some fifty distinct kinds of wheat, providing an authentic and permanent record of the wheats grown in Great Britain to-day, the result of ten years' research, and achieved by cultivating and classifying some 250 samples obtained from various districts.

Yearbook of Agricultural Co-operation. Edited by the Horace Plunkett Foundation. Pp. vi + 459. (London: P. S. King & Son Ltd. Price 12s. 6d.)

This volume continues the series of annual surveys issued by the Horace Plunkett Foundation. The introductory chapter outlines the history of the relations between co-operative movements and the State from the first Russian experiment in 1917 down to the present day. National planning is regarded as permanent, and the part that co-operative societies should play in relation to these plans is discussed.

The main part of the book is devoted to concise accounts of the progress of agricultural co-operation in various countries during 1933. The chapter on England betrays some misapprehension as to the position of producers under the marketing schemes. "The English farmer," we are told, "has no control over the appointed boards which administer schemes in the first year," although "at the end of the year he can, . . . if he so wishes, elect his own board, whose authority will still derive from the Minister of Agriculture." Actually, the original board is, as regards all but two members, nominated by the persons submitting the scheme, who must satisfy the Minister that they substantially represent producers; and at the end of the year the producers must elect their own board. It is understood, of course, that no scheme can become operative apart from Parliamentary approval. Further misapprehension is revealed in the statement that "the Minister, through the board, controls the prices at which contracts may be made by, or with the participation of, the board." It is true that schemes may provide for determining the prices at which producers shall sell the regulated products; but in none of the schemes now in operation has the Minister any part in the regulation of prices.

Attention is drawn to some defects in the marketing schemes now in operation, and increased collaboration is advocated between organized producers and consumers by means of the co-operative societies. The section dealing with Denmark should be read for its description of the steps taken with the aid of the co-operative societies to adjust production to meet the reduced requirements of the chief export markets, viz., Great Britain and Germany. The book concludes with the usual reviews and lists of marketing literature and a synopsis of the year's agricultural legislation.

The Pruning of Hardy Fruit Trees. By H. Dunkin. Pp. xiii + 82, and 43 figs. (London: J. M. Dent & Sons Ltd. 1934. Price 5s.)

A modern and detailed work on the pruning of hardy fruit trees has been needed for some years, but the gap may now be said to be very satisfactorily filled. Mr. Dunkin's book is designed for professional gardeners and fruit growers, but should also prove very valuable to advanced amateurs. The life-long experience and practical tests made by the author give true weight to the recommendations made, and his broadminded outlook is proved by descriptions of more

NOTICES OF BOOKS

than one method when such have proved satisfactory. The results of research workers and others, including Lorette, are lucidly described. Perhaps no service is more appreciated by intelligent growers than the presentation of scientific discoveries in such a way that they can immediately be put into practice.

Termites and Termite Control. Edited by C. A. Kofoed, Ph.D. Pp. xxv + 734, and 182 figs. (Cambridge University Press. Berkeley: University of California Press. 1934. Price 22s. 6d.)

Although termites do not constitute a menace to wooden structures in the United Kingdom, they have been responsible for immense damage to property throughout the British Empire, particularly in the tropics. This volume, which consists chiefly of a report issued by the Termites Investigations Committee of the United States of America, deals with the subject exhaustively. Termites are commonly termed "white ants," although they are not true ants, and not all the species are white. Their destructive habits are here described in detail but in simple, non-technical language, readily intelligible to the average reader. It is obvious that a large amount of labour and research have been involved in the production of this work, and, where termites occur, it should prove of great value to architects, biologists, contractors, entomologists, engineers, timber merchants and users of wood generally.

Land Problems of India. By Radhakamal Mukerjee, M.A., Ph.D. Pp. xii + 369. (London: Longmans, Green & Co. Ltd. 1933. Price 9s.)

Dr. Mukerjee has written a very able account of the extremely intricate system of land tenure in India; his book gives evidence of a wide knowledge of his subject, and of detailed and patient research. The system is traced from its early stages of village settlement, and the results of the superposition of western ideas of landlordism on a semi-feudal system are clearly brought out. In India, the sole interest of the landlord is to receive his rents, and between him and the tenant intervenes a chain of middlemen—proprietary, sub-proprietary and sub-sub-proprietary—who extort the utmost possible rent from the cultivator, and make no attempt to help him by bearing the cost of improvements of the land that he farms. The tenant is living frequently below the economic level and has no capital for improvements, so that the land rapidly deteriorates. He pays an extortionate rent and is overburdened with taxation, and even in a prosperous year it is barely possible for him to pay his way. The loans that he has contracted, and can never possibly pay off, tie him to the soil and render him, virtually, a slave.

Much legislation has been passed in the various provinces to give the peasant cultivator greater security of tenure, to protect him against the rapacity of the moneylender, to safeguard him against further sub-division of his holding, and to bring him into closer touch with his landlord by putting a check on subinfeudation. This legislation, however, has, in the main, been nullified by the ignorance of the *ryot* and the fact that the interpretation of the law is largely in the hands of his masters, the moneylenders.

Dr. Mukerjee makes an interesting survey of recent land reform in other countries, and especially in Russia, where an attempt has been made to meet problems very similar to those that arise in India. As in Russia, so in India, he would like to see a rehabilitation of the communal settlement. He would like each peasant to have an economic holding and to be in direct contact with his landlord—either a *zamindar* with a renewed interest in cultivation and the improvement of his land, or a benevolent state landlord; by this means the multiplicity of rent receivers and intermediaries, on the one

NOTICES OF BOOKS

hand, and the growth of the class of landless labourers on the other, would be checked, and the discontent arising from the difference between standards of urban and rural living would be modified. Dr. Mukerjee calls for a progressive rate of taxation on agricultural income, weighing most heavily on the non-cultivating classes. He would like to see all unsecured debts redeemed and settled, usurious rates of interest abolished, and all grades of existing tenants placed in permanent and heritable possession of their holdings. Finally, he would have debt cancellation and land courts established in every village to enforce the new system, and to ensure that it would not be perverted to their own use by the money-lending classes, as has been the fate of most ameliorative legislation in the past.

The problems discussed in this book are becoming pressing, and the growing feeling of unrest and peasant revolt call for rapid action. All who are interested in the problems of India should read this book, which not only fully sets out the difficulties in a clear and interesting manner, but indicates forcibly lines along which the solution of these difficulties might proceed.

The Drama of Weather. By Sir Napier Shaw. Pp. xiv + 269. Illustrated. (Cambridge: The University Press. 1933. Price 7s. 6d.)

Weather plays an important part in our lives. Its effects on agriculture need not be stressed. Our private affairs are, to a large extent, linked up with weather conditions; the tourist or holiday maker is very dependent on them for his complete enjoyment. Therefore we read, and listen to, weather forecasts in order to gain some idea of what the morrow may bring. Few, however, realize the mass of information and organization that go to bring us these forecasts, or the means whereby meteorologists arrive at the conclusions that tell us with surprising, though not infallible, accuracy what conditions are likely to be experienced.

In this book, the author (a former Director of the Meteorological Office and chairman, since the outset, of the committee that advises the Ministry of Agriculture and Fisheries on questions concerned with agricultural meteorology) presents a fascinating study of the "why and the wherefore" of the ancient science of meteorology. Sir Napier's "unconventional essays" (to borrow his phrase) develop the historical and practical sides of the science as the progress of a pageant, or drama, of the sequence of events in the sky. The "Prologue" deals exhaustively with clouds and other visible phenomena. The first chapter is mainly historical, and includes, on p. 74, a brief survey of agricultural meteorology. Subsequent chapters treat of instruments, observers, and observations.

Apart from some excellent cloud and other photographs, the book is copiously illustrated with graphs and diagrams. At first sight many of these last appear formidable, but they are so well explained in the accompanying text that there can be little difficulty for anyone in grasping and understanding their purport. Not the least interesting are the many step diagrams used to illustrate the rhythmic aspect of weather changes.

In a book of this sort, written by the expert for the layman, it is easy for an author to become wearisome. Sir Napier Shaw completely avoids this pitfall, and his volume is enlivened, in places, by a quiet whimsicality that is most attractive.

The "Degeneration" of the Strawberry. Pp. 28. (East Malling: Imperial Bureau of Fruit Production. 1934. Price 2s.) "Degeneration" of strawberries has, since the Great War, troubled strawberry growers in all parts of the world, and the problem has been tackled by numerous research workers, and from many angles. This memorandum consists of four papers by prominent research workers, prefaced with a foreword by Professor B. T. P. Barker, and forms

NOTICES OF BOOKS

a survey of the results obtained in each line of inquiry. D. Akenhead describes the pomological aspect of degeneration, indicating the importance of correct cultural treatment, and R. V. Harris deals with the results of experimental work on virus diseases. G. H. Berkeley (of St. Catharine's Laboratory, Ontario) discusses strawberry root rots, an aspect which has not yet received much attention in this country. A. M. Massee summarizes the results of research into the association of red spider, aphides, eelworm and tarsonemid mites with strawberry degeneration and the control measures recommended, i.e., hot-water treatment of the runners for twenty minutes at 110° F. Everyone interested in strawberries will appreciate this summary of present knowledge concerning strawberry degeneration; the busy grower will appreciate it as an informative summary of detailed research papers published all over the world and the research worker as a guide, through the excellent bibliography, to deeper study. The present issue, will, it is hoped, be the first of a long series of editions, each bringing fresh results to the attention of the industry.

Agricultural Progress. Vol. XI. Pp. 212. (Cambridge: W. Heffer & Sons Ltd. 1934. Price 5s.)

This volume opens with a symposium on "Recent Advances in Veterinary Science" consisting of papers by Dr. R. F. Montgomerie, Majors T. Dalling and G. W. Dunkin, and Messrs. R. E. Glover, F. Beckett and G. P. Male. These are followed by sections dealing with Agronomy, Animal Husbandry, Biology, Chemistry, Dairying, Education and Poultry, each containing articles by well-known writers on their respective subjects. The number closes with notes, reviews of books, and a record of recent activities, including a somewhat critical account of the International Poultry Congress held in Rome last year.

The Agricultural Register, 1933-34 Pp. vii + 229. (Oxford: Agricultural Economics Research Institute. 1934. Price 3s. 6d.)

This publication is intended to summarize without political prejudice the agricultural achievements of the past twelve months, whether resulting from legislative enactment or from organization within the industry. There are incidental references to Scotland and Northern Ireland, when those countries are concerned jointly with England and Wales. The information has been collected and arranged by the research staff of the Agricultural Economics Institute at Oxford. If the Register appears to supply a need, it is proposed to issue an annual volume, and the Director will welcome suggestions for extending its usefulness.

The Barn Owl in England and Wales. By G. B. Blaker.

Introd. by Sir George Courthope, M.P. Pp. 16, and 4 figs. (London: Royal Society for the Protection of Birds. 1934. Price 1s.)

This is an interesting and useful publication, and the small estimated total of 25,000 barn owls for England and Wales is evidence that it was time to take stock of what is possibly the most valuable of all our native birds. In the main one may agree with the author's suggested reasons for the decline of the species, but note that one important factor has been omitted—climate. In spite of its soft, downy plumage, the barn owl is a delicate bird and very susceptible to cold, and a succession of hard winters sometimes results in a serious increase in the mortality rate of the species. Many bird lovers will note with surprise that there are still districts in this country where the barn owl is not legally protected at all times, and will hope that this approach may shortly be removed. Any measures that are designed to improve the status of this very useful bird will be welcomed by all, and the author and the Society are both to be congratulated on drawing attention to the urgency of the matter.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 6 September, 1934

NOTES FOR THE MONTH

Cattle and Beef Survey

THIS useful and timely survey,* which was begun under the auspices of the Empire Marketing Board, presents in a concise and very readable form a mass of statistical and other material relating to the production and consumption of cattle and beef, and the trade therein.

The general plan of the book is similar to that of previous surveys in the series. In Parts I and II the more important producing countries are divided into two groups, namely, countries with an export surplus, and countries having import requirements; each group is subdivided into British Empire countries and Foreign countries. Separate chapters summarizing recent developments, with the aid of such statistics as are available, are devoted to each of the principal countries. Part III contains a chapter on the course of beef prices, and Part IV gives a general summary and conclusions.

Excluding India and China, where the cattle population is large but beef production unimportant, the numbers of cattle in the principal producing countries were about 300 million head in 1933, which represents an increase of about 10 per cent. over 1913. Production declined consistently between 1926 and 1931, but there has since been a substantial recovery. In general, the figures for the main exporting countries reveal an appreciable decline since 1925, whereas importing countries, such as Germany and Italy, have increased production. World trade in beef and veal declined by about 20 per cent. between 1930 and 1933, while that in cattle declined by 40 per cent. The pivotal position of Great Britain is shown by the fact that

* Cattle and Beef Survey: A Summary of Production and Trade in British Empire and Foreign Countries. Prepared by the Intelligence Branch of the Imperial Economic Committee. 367 pp. (London: H.M. Stationery Office, 1934, 5s., post free 5s. 9d.)

NOTES FOR THE MONTH

she absorbs not less than 80 per cent. of the supplies of beef and veal entering world trade; but only about 20 per cent. of the whole traded amount is of Empire origin. As a consequence largely of the efforts of importing countries to attain greater self-sufficiency through restriction of supplies from abroad, and of the diminished consumer purchasing-power since the depression, consumption per head in most countries has declined perceptibly in recent years. Beef prices have, on the whole, offered strong resistance to the downward pull of the depression, although the prices of frozen beef have suffered a severe decline.

As regards the future, the indications are that beef-exporting countries will have to reconcile themselves for some years to come to a diminution in external demand for their supplies, and their difficulties in this respect may become still more acute as herds in the importing countries continue to increase. The recent efforts on the part of the Southern Dominions and Southern Rhodesia to develop a trade with the Mother Country in chilled beef are noted, but it is pointed out that, apart from the technical difficulties of conservation in transit, much remains to be done, notably in regard to the more rapid maturity and the up-grading of stock, before the trade can assume substantial proportions. Meanwhile it is anticipated that the United Kingdom will have to rely on existing resources for the bulk of her imported beef supplies, and that the principal producing countries will be able to satisfy any increase in demand that may take place following an improvement in general economic conditions.

A Record Mangold Crop in New Zealand

LORD BLEDISLOE, Governor-General of New Zealand, has kindly forwarded particulars, published in *The Taranaki Daily News* of June 9, of a record mangold crop in the Dominion of New Zealand. These particulars are well worthy of notice as showing what skill and determination have been able to accomplish under good conditions.

When Mr. E. Jones, of Toko, raised a crop of 150 tons 7 cwt. last year, it was thought to be a world's record. In less than twelve months, however, it has been beaten by a crop of 170 tons 6 cwt. per acre produced by Mr. H. T. Paul at Okato, a well-known farmer who has been prominent in the local competitions for some time. His crop was three-quarters of an acre in extent, grown in a paddock

NOTES FOR THE MONTH

adjacent to the milking shed, a paddock where a herd of over 100 cows had been kept twice a day during milking time over a period of 10 to 15 years. The farmyard manure received by the paddock must be regarded as a contributory cause of the yield. Another factor was the method of cultivation employed. The area was ploughed early—on September 15. It was disced three times, harrowed twice and ridged. The seed of the Prize Winner variety, 4 lb. per acre, was sown on October 1 on the ridges by hand with a Planet Junior drill. The average width between the rows was 17 in. Special mangold manure was used at the rate of 6 cwt. per acre. It is better to cultivate a small plot that can be given special attention than a large one that, in the nature of things, can only receive ordinary care. In this instance the mangolds were hand-hoed eight times. The average weight on an area 11 ft. square was 1,060 lb., and this did not result from abnormally sized roots, but from the remarkable evenness in individual weight and the practically solid mass of root in every row.

It may be observed that the average yield of mangolds for England and Wales is a little short of 20 tons per acre. Yields of 30 to 40 tons, however, are not uncommon on good soils well cultivated, and at that figure mangolds are generally recognized to be a cheap, if not the cheapest, source of animal food. On sewage farms, or on land that has been highly farmed for several years, yields of 70, 80 and even 90 tons are sometimes recorded, and even the New Zealand record is probably not unattainable. With rows 17 in. wide, and spaced 10 in. apart, each mangold would have to weigh on the average 10 lb. in order to produce a yield of 170 tons per acre. Some idea of the food product of such a crop and, inferentially, of its cheapness, may be obtained from the following figures:—

Starch Equivalent per acre.

Mangolds	...	...	...	170 tons = 20,981 lb.
Wheat	...	...	...	6 qr. = 2,165 lb.
Rye Grass and Clover Hay	...			3 tons = 1,948 lb.

The New Zealand mangold crop therefore yielded ten times as much food value as a good British crop of wheat or seeds hay, and more than eight times as much as an average English crop of mangolds. Increased outlay on tillages and fertilizers can be very profitable when it reduces

NOTES FOR THE MONTH

the cost per unit of food produced in the proportion one may suspect was the case with the high yields under notice.

Factory-Abattoir Design

THE Report of the Technical Committee on Abattoir Design was issued by the Ministry of Agriculture and Fisheries at the end of July as one of its series of Orange Books on Agricultural Marketing.*

The Committee was appointed in December, 1933, under chairmanship of Sir Francis Boys, K.B.E., to consider and report on the technical requirements as regards output, structure, lay-out and equipment of factory-abattoirs in the light of modern practice at home and abroad in the processing and handling of meat, offals and by-products. Questions of policy as to the centralization of slaughtering were excluded from the Committee's consideration.

The Committee recommend that, to secure the full benefits of factory working, the normal minimum weekly kill of a factory-abattoir should be 320 cattle, with other live stock in proportion, though they admit the possibility that, in favourable circumstances, it might be worth while erecting a factory-abattoir to handle 200 cattle per week. They do not anticipate that, at the outset, it will be possible to spread the killing equally over the six days of the week, in view of the present concentration of slaughtering over two or three days a week, and accordingly, in designing their "standard" factory-abattoir, they have based their estimates on an average minimum daily kill of 80 cattle for four days a week. On the assumption that, in the provincial centres of population, the consumption of home-killed meat is about equal to that of imported, such an abattoir would serve a population of about 260,000.

The Committee favour a multi-floor factory-abattoir—three main floors with a mezzanine floor—in preference to a single-floor building, on grounds both of cleanliness and public health and of economy in operation. They draw attention to the difficulty in a single-floor abattoir, of keeping the slaughter floor clear of such sources of contamination as the hides and skins and inedible offals which, in a multi-floor abattoir, can quickly be removed by chute

* Abattoir Design. Report of the Technical Committee. Economic Series No. 40, obtainable from H.M. Stationery Office (Adastral House, Kingsway, London, W.C.2) or through any bookseller, price 1s net or 1s 2d post free

NOTES FOR THE MONTH

to the floors below, while such use of gravity as a means of removing the various offals and by-products to their respective departments for treatment is more economical than conveyance in trolleys.

Detailed recommendations as to lay-out, equipment and routine of operations are made. The Committee recommend that, in order to raise the general level of the condition of home-killed meat, all the meat and red offals should be adequately cooled before they are allowed to be taken away, and for this reason they have provided for considerable cold storage space. As regards other offals, etc., the general principle of the lay-out is that the various offals and by-products should be sent promptly by chute direct from the slaughter hall to their respective departments for treatment and disposal with a minimum of handling. Provision is made for the production of dripping, sausage skins, tripe and calves' feet, technical tallow, meat meal, blood manure, fertilizers and preserved glands. Hides and skins would not be treated, but would be delivered daily to the hide and skin merchants on behalf of the owners. The Committee regard a wholesale meat market as usually an indispensable adjunct to a factory-abattoir of the size they recommend.

On the basis of expert advice obtained from architects and specialists in abattoir design, the Committee estimate that the cost of constructing and equipping a "standard" sized single-floor or multi-floor factory-abattoir, of which diagrammatic plans are included in the Report, would be in the neighbourhood of £125,000 (excluding cost of site but including architect's and surveyor's fees). They consider that there would not be much difference in first cost between a single-floor and a multi-floor factory, though the running costs of the latter would show a substantial saving.

The Committee also indicate the variations in space required for the different departments to handle larger and smaller kills than the standard minimum average kill recommended. Broadly, the accommodation for a larger kill would not increase proportionately to the number of animals to be handled, and consequently the larger the kill the more economically could the factory-abattoir be operated. The Committee point out, however, that by working six days a week, a factory of the size recommended could handle a considerably increased throughput without serious difficulty or structural alteration.

NOTES FOR THE MONTH

The Committee regard it as essential that the factory-abattoir and all the operations therein, from the receipt of the live stock to the despatch of the resultant products, should be entirely under single control, and that such by-products as require processing before marketing, should be processed at the factory. Consequently, in order to ensure the economic working of the plant installed, they consider that the management should be empowered to settle, after negotiation, what by-products from the animals slaughtered are to be retained at the factory for treatment (and the price to be paid for them by the factory) and what by-products are to be returned to the persons on whose behalf the live stock are slaughtered. The Committee suggest that, in order to minimize the difficulties of adjusting the slaughtering charges (which should include lairage, slaughter, dressing and use of cooler), and particularly the prices for by-products retained at the factory-abattoir for processing—difficulties that might prejudice the efficient working of a well-designed establishment—public factory-abattoirs might be leased to, and operated on a service basis by, slaughtering and by-products companies or associations formed from among persons on whose behalf stock would be slaughtered. Under such arrangements, the Local Authority would be relieved of the actual management of the establishment and yet could reserve to itself the right of general supervision, in order to ensure the impartial service of a municipally controlled abattoir, in addition to its statutory duties in connexion with public health.

New Association for Small Holdings for Unemployed Persons

ON July 30 the Minister of Agriculture announced that the following persons had accepted his invitation to co-operate in constituting an Association to carry out an experimental scheme for the provision of small holdings for unemployed persons, with financial assistance from the Government on the lines indicated, on May 17 last (This JOURNAL, June, 1934, p. 224):—

The Earl of Elgin.
Lord Phillimore.
Lady Denman.
Sir Percy Alden.
Sir Percy Jackson.
Mr. F. N. Blundell.
Capt. Geoffrey Crawshaw.
Col. G. B. Crossfield.

Mr. F. E. Dodson.
Mr. W. L. Hichens.
Col. J. M. Mitchell.
Mr. A. C. Richmond.
Mr. John Robson.
Mr. P. M. Stewart.
Professor J. A. Scott Watson.

NOTES FOR THE MONTH

Diseases of Animals in 1933

THE Report of Proceedings under the Diseases of Animals Acts for the year 1933, recently issued,* describes the position of the country with regard to animal diseases, and states that Great Britain continued to be free from cattle plague (rinderpest), contagious pleuro-pneumonia, sheep-pox, rabies, epizootic lymphangitis and glanders. There were 87 outbreaks of foot-and-mouth disease, 54 of which occurred during the first quarter of the year, and 22 in October. There were no outbreaks during five months of the year, viz., April, June, July, November, and December. Of the 31 new centres of infection during 1933, twelve were attributable to a common source, viz., Reading railway loading docks. The course of events as they occurred in the field is fully described in the Report. There was no alteration of the established policy of the Ministry in dealing with this disease, known as the slaughter policy, which consists of the immediate compulsory slaughter of all animals affected with the disease and of those directly exposed to infection.

There was an appreciable decrease (9 per cent.) in the number of outbreaks of swine fever as compared with the year 1932; also a decrease (11 per cent.) in the number of outbreaks of anthrax; but a slight increase (4 per cent.) in the number of outbreaks of parasitic mange of equine animals. The number of outbreaks of sheep scab, however, showed a heavy increase (60 per cent.) due principally to the discovery of widespread disease in the counties bordering the Pennine Range of Hills. The Report describes at length the measures taken for the control and eradication of the disease. In other parts of England the number of outbreaks of sheep scab showed a reduction of 19 per cent., but in Wales there was an increase of 8 per cent. In Scotland the position continued to be satisfactory.

The usual details showing the results of the administration of the Tuberculosis Order of 1925 by Local Authorities during the year 1933 are given, with comparative statements for the two preceding years. The number of cattle examined by veterinary inspectors, under the provisions of the Order, rose from 302,354 in 1932 to 350,550 in 1933, and the number of cattle slaughtered increased by 1,881 to

* Report of Proceedings under the Diseases of Animals Acts for the year 1933: H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 2s., post free 2s. 2d.

NOTES FOR THE MONTH

the figure of 20,908, the highest yet recorded.

Part II of the Report deals with the measures taken to prevent the introduction and spread of disease in this country and describes the general preventive Orders in force. Particulars are given of the animals imported from Ireland and other countries and of the cases of disease found in imported animals, which were limited to one case of tuberculosis in a cow imported from Northern Ireland and 21 cases of sheep scab, 11 from Northern Ireland and 10 from the Irish Free State.

Part III describes the administration of the measures for the protection of animals from unnecessary suffering during transit by land and sea. The principal feature in the transport of animals by sea in 1933 was the increase in the number of Canadian cattle carried to Great Britain as a result of the extended facilities afforded by Section 8 of the Ottawa Agreements Act, 1932. In addition to the 12 vessels regularly employed, 7 other vessels were specially fitted in Canada for this trade. The records show that the percentage of casualties in all classes of the traffic in animals was negligible.

Part IV deals with the certification by the Ministry of animals and animal products for export so as to comply with the regulations of the importing countries, and also describes the working of the London Quarantine Station for exported pedigree stock, including certain alterations in its administration.

Part V summarizes the diagnostic and research work carried out at the Ministry's Veterinary Laboratory and Research Institute at Weybridge, including also the preparation and issue of vaccines for animals and poultry, and the conducting of agglutination tests of poultry.

Part VI, which is a "Miscellaneous" section of the Report, includes a reference to the annual meeting of the International Veterinary Bureau in Paris, and to the position as regards certain poultry diseases in this country.

The Appendices to the Report contain the usual statistical tables of scheduled animal diseases confirmed in each county in Great Britain, the live-stock population, animals imported and exported, numbers and breeds of stock exported with the Ministry's certificates, and the incidence of certain animal diseases in European countries, together with useful summaries of the regulations governing the importation of live animals into Great Britain from abroad,

NOTES FOR THE MONTH

and the export of animals through the London Quarantine Station.

Surrey Women's Institutes and Food Production

PRESENT-DAY development of the agricultural activities of Women's Institutes was strikingly illustrated by the Market Fair and Co-operative Produce Exhibition organized by the Surrey County Federation in July. The Duchess of Northumberland, who opened the exhibition, had lent Albury Park, Guildford, for the occasion, and in these ideal surroundings the agricultural contribution of the women of the Surrey countryside was delightfully displayed.

The co-operative exhibits were staged in a large marquee. In Group A (Store Cupboard Shelf) there was a wonderful collection of preserves, bottled fruits and vegetables, pickles and home-made cordials. Eggs, poultry, butter, cream, cheese and honey in Group B were all of excellent quality. There were splendid contributions of vegetables, salads and soft fruits in Groups C—E, and a great array of tuck-boxes (Group F), which included cakes and sweets.

The exhibits staged by the county staff for agricultural education and the demonstrations given by the staff in the course of the day evidenced the importance attached by the local authority to the agricultural services rendered by Surrey W.I.'s.

The outstanding feature of the Exhibition, however, was the market stalls, some 40 in number, on which produce was being sold. These stalls were run by individual W.I.'s. or by groups (of not more than three Institutes) and presented a varied and tasteful appearance while offering a remarkable assortment of commodities. The stalls competed for the Helena Auerbach Cup, in the award of which staging, appearance, variety, utility, condition of produce, grading, packing, trading, booking and general management were all taken into account. The judging was undertaken by Miss Hirst Simpson and Miss Cox (of the N.F.W.I.), and Mrs. Studdert (late of the Ministry of Agriculture), who pointed out to the audience the advantages of systematic packing and grading and the proper presentation of goods.

Demonstrations of country arts, such as broom-making and the rearing of silk-worms, were among the side shows, and the function was further enlivened by mimes and folk dancing.

NOTES FOR THE MONTH

An attendance of some 7,000 people proved the interest taken in the enterprise throughout the country. As a result of the day's labours nearly £500 will go to the County Federation's Central Fund. Upwards of £400 worth of goods was sold, which means that a good deal of money went back to the villages of Surrey. The success of the day, however, was not merely a matter of pounds, shillings and pence. The educational value of the meeting cannot be easily measured, but it is certain that a very great stimulus has been given to the women of Surrey in their work of producing and marketing foodstuffs. Their ability in these directions was a revelation to many of the visitors.

Last, though perhaps not least, such a day is noteworthy because it is a continuation, under modern conditions, of the English merry-making of the past. It exemplified the neighbourliness of village life and the pleasure that countryfolk still find in natural delights. Members of the Surrey Federation of Women's Institutes desire to preserve the beauty of the countryside, and the way in which the ground was kept free from litter was an example that should be widely followed.

Liver Rot and the Drought

As a result of the prolonged drought the breeding places of the small water snail that is responsible for the early development of the liver fluke have been considerably reduced; large areas of wet land have become dried, and only small wet patches and restricted pools have been left behind. A splendid opportunity is thus afforded for taking a decisive step towards the eradication of the liver fluke from the farm. The few remaining haunts of the snail (centres of infection for the liver fluke) should be dressed with a mixture of finely-powdered bluestone and dry sand, in the proportions of 1 to 4, and at the rate of $1\frac{1}{2}$ to $2\frac{1}{2}$ cwt. to the acre. Great benefit will result from this treatment, which may be repeated with advantage after an interval of three weeks. It is, however, a wise precaution to keep sheep and cattle away from the treated ground until after rain has fallen.

As a further step towards the eradication of the parasite from the farm the treatment of all adult sheep with carbon tetrachloride, or alternatively, extract of male fern, is also recommended at the present time. This applies to every member of the flock and not only to sheep that appear to

NOTES FOR THE MONTH

be thriving badly. As a result of the dry season it is unlikely that the sheep are now carrying anything but mature flukes, and treatment may be expected to expel all that they are carrying without leaving behind a residue of immature flukes, as usually happens when treatment is carried out at other times. Farmers are warned, however, that care must be observed in the use of carbon tetrachloride because of the poisoning that occasionally results.

Further particulars are given in the Ministry of Agriculture's Advisory leaflet No. 89, copies of which may be obtained, free of charge, on application to 10, Whitehall Place, London, S.W.1.

Agricultural Statistics (Part I), 1933

THE MINISTRY'S Annual Report on the acreage and production of crops and the numbers of live stock in England and Wales in 1933 is now available. The Report contains information as to the acreage of crops, the numbers of live stock (including poultry), and the numbers of agricultural workers actually in employment on June 3 as returned by the occupiers of agricultural land exceeding one acre in extent. Particulars are also given of the production of the various crops and of live-stock products, including meat, milk, eggs and wool. The tables attached to the Report contain detailed figures for each county in England and Wales of the acreage under each crop, the numbers of each class of live stock, and the estimated yield per acre of the principal crops for the years 1933 and 1932. Summaries for Great Britain and the United Kingdom for the last ten years are also given.

The Report forms Part I of the Agricultural Statistics of England and Wales, 1933, and may be obtained through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s. 6d., post free 1s. 8d.

Agricultural Statistics (Part II), 1933

THE MINISTRY'S Annual Report on the prices and supplies of agricultural produce and requirements, relating to the year 1933-34, has now been published. The Report discusses the movements in prices and changes in sources of supply of the principal agricultural commodities in the year 1933, in comparison with those in previous years and

NOTES FOR THE MONTH

part of the year 1934. A special feature of the Report is a review of the quantitative regulation of imported produce, and the recent changes in Customs duties are included in two appendices showing in detail the period of operation, amount of duty, etc.

The Report, which forms Part II of the Agricultural Statistics, 1933, may be purchased through any bookseller or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s. 6d. net or 1s. 8d. post free.

Fruit Supplies in 1933

THIS volume,* which is published as a supplement to the Imperial Economic Committee's Weekly Fruit Intelligence Notes, is the fourth in the series of Annual Reviews of Fruit Supplies in the United Kingdom, and follows the same lines as previous volumes. Statistics relating to United Kingdom production and imports of fruit and vegetables (including flowers and bulbs) in 1933, are analysed and compared with those of previous years. In addition, the survey contains brief reviews of the fruit seasons in the principal exporting areas and of imports of fruit into the chief continental markets and the United States.

Supplies of fruit in the United Kingdom were unusually large in 1933 and consumption, estimated at 89 lb. per head, was the highest yet reached. Not only was the home crop, especially of plums, a heavy one, but imports of fresh fruit also established a new high record, being more than 1½ million cwt. in excess of 1932. Imports from Empire countries, which amounted to over 12 million cwt., or over 40 per cent of the total, exceeded the previous record, established in 1932, by about 1½ million cwt. In contrast, imports of fresh fruit into Germany were less than in 1932, while those into France showed only a small increase.

The changes in imports of different kinds of fruit are also of interest. Imports of apples declined in 1933, although shipments from Empire countries were in record volume. Bananas, grapes, pineapples, plums and strawberries were also in smaller supply than in former years. On the other hand, imports of oranges, lemons and peaches attained new high levels.

* Fruit Supplies in 1933. Prepared by the Intelligence Branch of the Imperial Economic Committee. 95 pp. June, 1934. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s., post free 1s. 4d.

NOTES FOR THE MONTH

All those who desire to follow the developments in the market for fruits and vegetables would certainly do well to secure a copy of this survey.

Agricultural Machinery Testing Committee

THE undermentioned Certificate and Report, issued by the Ministry, have been published in pamphlet form (price 2*d.*, post free 2½*d.*):—

No. 50. Dymond Milk Cooler, submitted for test by the inventor, Mr. Arthur Dymond, Street Ash Farm, Combe St. Nicholas, near Chard, Somerset.

The test was conducted at the National Institute for Research in Dairying, Shinfield, near Reading.

Copies of the pamphlet may be obtained at the price stated, through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

Sampling Observations on Wheat ; Preliminary Report on Harvest Yields

THE table overleaf shows the actual harvest yields from 8 of the 10 centres engaged in the Wheat Sampling Observations described in previous issues. At Long Sutton, the crop failed through wireworm attack in March; and the results at Boghall, Midlothian, are not yet available. It is intended to publish similar statements each year as soon as possible after harvest, as it is thought that the yields of these plots, on which standard varieties are grown under closely comparable conditions year by year, will form some index of the excellence or otherwise of the season from the wheat grower's point of view.

The present season appears to have been even better than last season. Of five stations at which comparisons are at the moment possible, four have higher yields of grain. The mean yield of these five stations is—

		<i>Grain.</i>		<i>Straw.</i>	
		<i>1933.</i>	<i>1934.</i>	<i>1933.</i>	<i>1934.</i>
Squarehead's Master	...	19.6	28.0	42.4	42.0
Yeoman	... ..	22.9	26.6	41.5	38.6
Mean	... ..	21.2	27.3	42.0	40.3

The varieties chosen as of local interest and suitability have again done as well as or better than the two standard varieties at all stations where they were grown.

NOTES FOR THE MONTH

SAMPLING OBSERVATIONS ON WHEAT: YIELDS, 1934.

Station	Variety	Yields, cwt. per acre			
		Grain		Straw	
		1933	1934	1933	1934
CIRENCESTER Gloucestershire	Squarehead's	—	28'1	—	59'2
	Master	—	37'2	—	61'6
	Yeoman	—	37'2	—	61'6
ROTHAMSTED Hertfordshire	Squarehead's	21'8	32'3	35'9	45'0
	Master	22'6	32'0	34'4	46'4
	Yeoman	26'5	32'0	38'0	41'1
PLUMPTON Sussex	Squarehead's	—	37'6	—	43'5
	Master	—	32'7	—	35'8
	Yeoman	—	32'7	—	35'8
SEALE-HAYNE Devonshire	Squarehead's	23'0	33'0	42'7	48'3
	Master	18'7	31'8	35'2	40'5
	Yeoman	25'2	43'6	35'9	53'6
WYE Kent	Squarehead's	6'1	23'8	39'6	41'8
	Master	15'6	26'0	32'3	42'2
	Yeoman	15'6	26'0	32'3	42'2
BOGHALL Edinburgh	Squarehead's	32'3	*	61'7	*
	Master	33'3	*	67'8	*
	Yeoman	33'3	*	67'8	*
NEWPORT† Shropshire	Squarehead's	32'9	41'4	51'0	63'9
	Master	37'8	45'9	56'4	68'1
	Yeoman	37'8	45'9	56'4	68'1
LONG SUTTON Hampshire	Squarehead's	26'3	§	31'6	§
	Master	28'9	§	35'4	§
	Yeoman	31'5	§	35'8	§
WOBURN Bedfordshire	Squarehead's	22'4	20'5	49'9	37'5
	Master	31'9	17'2	57'4	28'8
	Yeoman	—	23'5	—	42'0
SPROWSTON Norfolk	Squarehead's	24'8	30'5	43'8	37'3
	Master	25'7	26'0	48'3	35'2
	Yeoman	—	31'2	—	38'2

* Not yet available.

† Returns not included in the mean yield table
overleaf

§ Crop failed.

THE EMERGENCY PROVISIONS FOR ASSISTING THE CATTLE INDUSTRY

The Live-stock Situation, July, 1934.—A statement on the live-stock situation of the United Kingdom, issued by H.M. Government on July 11 last,* showed that the prices of fat and store cattle were then below pre-War levels. It was observed that, although the action taken, since November, 1932, to regulate meat supplies had been followed by an appreciable rise in the prices of sheep, the situation as regards cattle had continued to deteriorate throughout 1933, and even the cut of 50 per cent. in fat cattle supplies from the Irish Free State, made by Order in December, 1933, had not led to any improvement in the position. That it had not been possible to regulate with any exactness the total imports of beef coming on the home market had been an important factor in the situation; and, although reductions had been effected in many directions, the total weight of beef supplies in 1933 actually exceeded that of 1932.

To relieve the grave position of the home beef producers, the Government examined the possibility of—

- (a) a drastic reduction of imports by means of quantitative regulation;
- (b) action along the lines of the Wheat Act, 1932, involving the collection of a levy on imports of meat† to provide a fund from which payments could be made to supplement the returns accruing to home producers from the sale of their stock in the open market, imports being unregulated;
- (c) a levy on imports and payments to producers, as referred to above, coupled with some degree of direct supply regulation in the interests of all suppliers.

It was desired that any temporary proposals that might be necessary for the immediate relief of the beef situation should lead up to the formulation of a permanent policy for the live-stock industry; for while present market conditions are not unsatisfactory for some classes of stock, problems similar to those of the beef industry are involved, and any long-term proposals, therefore, would need to cover, should occasion arise, the whole field of the live-stock industry.

* Command Paper 4651. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1d., post free 1½d.

† The term "meat" is to be understood as not including bacon or hams.

EMERGENCY PROVISIONS FOR THE CATTLE INDUSTRY

The Government were of opinion that a plan, based upon (c) of the alternatives above, providing for a levy on imports and a regulated market, would afford the best long-term solution of the problem, and one that would hold the balance evenly between producer and consumer. Such a plan would establish, under the control and management of a permanent Commission, a fund into which would be paid the proceeds of a levy on all imported meat, including live stock. It was not contemplated that such levy would exceed 1d. per lb., with a preference to the Dominions. Out of the fund thus provided, such payments would be made to producers of live stock in the United Kingdom as might be justified by the market situation and as might from time to time be determined. It would be an essential function of the Commission to co-operate with any Producers' Marketing Board that might be constituted, and with any other interests concerned, in a reform of marketing and slaughtering systems, in order to secure the greater economy and efficiency that the Government regard as indispensable for the permanent prosperity of the live-stock industry.

For the consideration of proposals of such importance, however, time and opportunity were required, as action on the lines indicated in (c) would affect the Ottawa agreements with the Dominions, and the agreement with Argentina, particularly as regards the levy on imports, and could be instituted only by agreement with the Governments concerned. In the absence of such agreement, the only action, as regards imports of meat, immediately open to the United Kingdom Government lay in a further regulation of supply, designed, (1) to hold the position for the time being, and (2) to bring about a material improvement in market conditions. Yet action on these latter lines, on the extended scale that would be necessary, would have presented problems of such a serious nature to certain of the Governments concerned that the United Kingdom Government felt compelled to allow time for further examination of the various alternatives; and, with this object, opened up discussions with the representatives of the Governments concerned.

In the meantime, steps had to be taken to relieve the position of the home producer, and the Government decided, therefore, to introduce a short-term emergency measure that could be passed by Parliament before rising for the summer recess.

EMERGENCY PROVISIONS FOR THE CATTLE INDUSTRY

Cattle Industry (Emergency Provisions) Act, 1934.—

The Financial Resolution in connexion with the proposed measure was taken on July 12, and the Bill was introduced by the Minister of Agriculture and Fisheries, passed through all its stages, and received the Royal Assent and became law by July 31. This Act, the "Cattle Industry (Emergency Provisions) Act, 1934,"* contains six sections.

Section 1 provides for the establishment of "the Cattle Fund," to be administered and controlled by the "appropriate Ministers" concerned with agriculture in the United Kingdom;† and it authorizes the Treasury, during the current financial year ending March 31, 1935, to make, out of the Consolidated Fund, advances to the Cattle Fund not exceeding £3,000,000.

Section 2 empowers the appropriate Ministers, in accordance with arrangements and regulations approved by them, to make payments out of the Cattle Fund to the producers of cattle in respect of steers, heifers or cow-heifers, or the carcasses of such animals, that have been sold by the producers in the United Kingdom during the period beginning not earlier than September 1 and ending on March 31, 1935. The payments in the case of live animals shall be at such rate per cwt. not exceeding five shillings as may be specified in an Order made by the Ministers and approved by the Treasury; and payments in respect of carcasses shall be at such rate per cwt. not exceeding nine shillings and fourpence as may be specified in an Order so made and similarly approved. There are certain provisions as to the animals and carcasses that are eligible for certification under the Section.

Section 3 empowers the appropriate Ministers to make Orders for the marking of cattle imported into the United Kingdom, and prescribes penalties for contravening or failing to comply with such Orders, and for altering or defacing, with intent to deceive, any mark placed on an animal for the purposes of an Order.

Section 4 empowers the appropriate Ministers to appoint "the Cattle Committee," whose duty it shall be to advise those Ministers generally in the discharge of their functions under the Act; also to prepare and submit to the Ministers particulars of such arrangements as are mentioned in Section 2 of the Act, and, if the Ministers so direct, to carry into effect any such arrangements approved by them. The section also provides for the appointment of a Secretary to the Cattle Committee; for the employment by that Committee of such officers, agents and servants as the Ministers, with Treasury approval, may determine; and for the remuneration of members of the Cattle Committee and their officers, etc. The expenses thus incurred, and such other expenses as may, with the approval of the Treasury, have been incurred by the appropriate Ministers for the purposes of the Act, are to be defrayed out of the Cattle Fund.

Section 5 is mainly interpretive. It defines the terms "producer" of cattle and "cow-heifer"; stipulates that cattle removed from the Isle of Man into the United Kingdom shall be deemed to be imported into the United Kingdom; interprets the power or duty to make orders under the Act; and provides that the Minister of Agriculture and

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 2d., post free, 2½d.

† The "appropriate Ministers" in this connexion are, for England and Wales, the Minister of Agriculture and Fisheries; for Scotland, the Secretary of State for Scotland; for Northern Ireland, the Secretary of State for the Home Department [England].

EMERGENCY PROVISIONS FOR THE CATTLE INDUSTRY

Fisheries shall prepare the accounts of the Cattle Fund in such form, etc., as the Treasury may direct.

The Cattle Committee.—Under the provisions of Sec. 4 of the Act, the appropriate Ministers appointed, on July 31, the following to be members of the Cattle Committee:—

Lt-Col. Sir John Robert Chancellor, G.C.M.G., G.C.V.O., D.S.O. (Chairman);
Sir Francis Theodore Boys, K B.E. (Vice-Chairman);
Mr. George Dallas, J.P.;
Mr. William James Harvey,
Mr. Harold Gibson Howitt, D.S.O., M.C., F.C.A.;
Mr. John Boyd Orr, D.S.O., M.C., M.A., M.D., D.Sc., F.R.S.;
The Hon Jasper Nicholas Ridley, J.P., B.A.;
and as Secretary to the Committee.

Mr. Charles Thomas Houghton (of the Ministry of Agriculture and Fisheries), to whom communications on the business of the Committee should be addressed at 1, Sanctuary Buildings, Great Smith Street, Westminster, S W 1.

Particulars of Arrangements for the Purposes of Section 2 of the Cattle Industry (Emergency Provisions) Act, 1934.—The Cattle Committee have drawn up "Particulars of Arrangements for the Purposes of Section 2"* of the Act, and, on August 10, these were approved by the appropriate Ministers, who directed the Committee to carry them into effect.

The Arrangements provide that every producer of cattle who desires to claim payment in respect of an animal or carcass shall present the animal at a centre approved by the Cattle Committee for the purpose, to be known as a Certification Centre. It is provided that at live-weight centres Certifying Authorities will be appointed, consisting of three persons who will be responsible for determining whether an animal is an eligible animal, for ensuring that the animal is properly weighed, that its weight is accurately recorded and that it is properly marked in accordance with the Arrangements. The Arrangements include provisions relating to the weighing and marking of animals.

The weight to be recorded is the actual weight of the animal to the nearest quarter of a hundredweight, and it must be recorded immediately the weighing is completed. The Certifying Authority are empowered to take all necessary steps to ensure that the weighing machine used is accurate; and the Cattle Committee may, at any time, require the owner of a weighing machine, used for the

* Command Paper 4678, obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 3d., post free, 3½d.

EMERGENCY PROVISIONS FOR THE CATTLE INDUSTRY

purposes of the Act, to have it tested by an Inspector of Weights and Measures.

The marking is to be done by means of an ear punch supplied by the Cattle Committee, the right ear of the animal being punched just below the tip obliquely from the edge, so that the hole will be made between the principal veins. The marking is to be done before the certificate is issued.

At each centre a Certifying Officer will be appointed who, in addition to his duties as a member of the Certifying Authority, will be responsible for issuing a Certificate in respect of eligible animals. There are for live animals two forms of Certificate which are reproduced in the Schedule of Arrangements. Form A is to be used whenever the Certifying Officer is (1) able to certify that the animal has been sold by the producer claiming payment; (2) is satisfied that the person in respect of whose animal it is issued is a producer within the meaning of the Act; and (3) can give the other particulars required on the Certificate. Form B is to be used in all other instances.

In certain circumstances, approved fees may be paid to members of Certifying Authorities, the expense of which will be met by a certification charge not exceeding 1*d.* per animal certified in respect of each member paid. In addition to this charge, a Certifying Officer is authorized to make a certification charge at a rate not exceeding 1*s.* 3*d.* in respect of each animal certified.

Special procedure is prescribed for live-weight certification centres in Northern Ireland. Under this, the Cattle Committee may appoint an officer of the Ministry of Agriculture for Northern Ireland, or such other person as they consider suitable, to act both as a Certifying Authority and a Certifying Officer in Northern Ireland, and they may appoint a deputy for him.

At dead-weight certification centres, where payment will be claimed by the producer in respect of the sale of a carcass, the duty of determining the eligibility of animals and carcasses will be performed by a Certifying Officer who will also issue the necessary Certificate, the form of which is set out in the Schedule. The Arrangements also contain provisions with regard to the weighing of carcasses and the marking of animals and carcasses. A carcass shall be weighed within 24 hours of the slaughter of the beast. The certified weight of the carcass shall be the actual weight

EMERGENCY PROVISIONS FOR THE CATTLE INDUSTRY

of the carcass when cold, the weight being recorded in pounds disregarding fractions of a pound. If the kidneys have been removed before weighing, an addition of 3 lb. will be made to the actual weight. If the carcass is weighed hot (i.e., within 1 hour of slaughter) a deduction will be made, according to the weight of the side, for the purpose of determining the equivalent weight when cold. The deductions are:—5 lb. for sides up to 300 lb. weight; 6 lb. for sides over 300 lb. and up to 400 lb., and 7 lb. for sides over 400 lb.

The Certifying Officer may require a producer who intends to present an animal for certification at a Dead-weight Certification Centre to mark the animal in such manner as he may prescribe for the purpose of identifying it on arrival at the centre. To an animal that he has determined is eligible, the Certifying Officer may apply such mark as he considers desirable to facilitate the task of certification. He may also apply an identification mark to the carcass as soon as practicable after slaughter. The Certifying Officer at a Dead-weight Centre is authorized to make a charge on the producer for each Certificate issued, at a rate not exceeding a rate that may be prescribed by the Cattle Committee.

Among other provisions in the Schedule of Arrangements is one enabling the Cattle Committee in exceptional circumstances, where they consider the ordinary procedure is inappropriate, to make special arrangements, as they deem necessary, for certifying an animal or carcass.

An officer of the Cattle Committee, or an officer of any one of the Departments of Agriculture in the United Kingdom, duly authorized by the Cattle Committee, may be present at the examination, weighing or sale of an animal or carcass, or during the subsequent certification.

Orders and Regulations Made under the Act.—On August 2, the appropriate Ministers made an Order under Section 3 of the Act providing for the marking of imported cattle.

On August 15, the appropriate Ministers made the Regulations referred to in Section 2 of the Act. These Regulations prescribe that the standard to which a steer, heifer or cow-heifer shall conform, in order to be eligible for payment under the Act, shall be a killing-out percentage as estimated by the Certifying Authority of not less than 52 per

EMERGENCY PROVISIONS FOR THE CATTLE INDUSTRY

cent., that is to say that it is estimated by them that the weight of its carcass, as dressed in accordance with the Regulations, will be in the proportion of 58 lb. to each hundredweight of its weight when alive. The Regulations also prescribe the standard of dressing to which carcasses will have to conform for the purpose of the payments under the Act.

On August 21, an Order was made under Section 2 (2) of the Act. This Order fixes the rate per hundredweight at which the amount of any payment to be made under Section 2 of the Act shall be computed at 5s. in the case of the live animal and at 9s. 4d. in the case of a carcass. These are the maximum rates permitted under the Act. The Order also provides that, for the purposes of computing payments under Section 2 of the Act, the weight of any live animal shall be determined by ascertaining the weight of it to the nearest quarter of a hundredweight as recorded on a weighing machine, or, in an instance where the Cattle Committee is satisfied that no weighing machine is available, as determined in such manner as may be approved by the Cattle Committee (which weight is in the Regulations referred to as "the actual weight") and by deducting 28 lb. from the weight so ascertained. The Order also provides that no certificate shall be issued for the purpose of payment under Section 2 of the Act in respect of any animal of which the actual weight or the weight as estimated by the Certifying Officer at a Dead-weight Certification Centre, is less than $5\frac{1}{2}$ cwt.

Handbook.—The documents referred to above have been brought together and reproduced in one book entitled the Cattle Industry (Emergency Provisions) Handbook, which has been published as No. 41 of the Ministry's Economic Series of Orange Books on Agricultural Marketing. This Handbook can be obtained through any bookseller, or, direct from H.M. Stationery Office at any of the addresses given on the front cover of this JOURNAL, price 1s., post free 1s. 2d.

THE CAHN HILL-IMPROVEMENT SCHEME

Professor R. G. STAPLEDON, C.B.E., M.A.,
Welsh Plant Breeding Station, Aberystwyth.

A SHORT account was given in the June (1933) number of this JOURNAL of the inauguration of the Cahn Hill-Improvement Scheme. Now that possession has been taken of all the land in connexion with the Scheme, and the work is in full operation, it will probably be of interest to enlarge upon the aims and scope of the undertaking, and to give a short account of the lines upon which the land is being used.

The Aims and Scope of the Scheme.—Broadly speaking, the work that is being undertaken is concerned with the considerable area of the country scheduled as rough and hill grazings—an area that totals over 15 million acres in Great Britain as a whole, which is equivalent to rather over a quarter of the land area of these Islands. It is, of course, perfectly true that by far the largest proportion of this acreage stands at over 600 ft. above sea level, and, on this account, may be considered by some as of relatively little importance.

It is also perfectly true that the whole area of land, of which possession has been taken on behalf of the Scheme, stands at an elevation of from 900 ft. to about 1,800 ft. above sea level, and that the greater proportion is at an elevation of over 1,100 ft.

Certain very definite things can, however, be said in justification of the action that has been taken. The first is that we are dealing with a type of land that constitutes a very large unit in the country. In Wales itself it is nearly as large as the whole area under permanent grass. In Scotland it is a larger area than that occupied by arable land and permanent grass together. It is, moreover, a type of land that has been less investigated than any other. We are assuming that such land can be improved, and on an economic basis, and, in any event, it must be conceded that we have every bit as much justification for assuming that economic improvement is possible as others (without experimentation) have for assuming that economic improvement is impossible.

THE CAHN HILL-IMPROVEMENT SCHEME

On the other hand, had we confined ourselves to a block of country not exceeding, say, 800-900 ft. above sea level, we could not have acquired anything like the range of vegetational types upon which to experiment as we have in fact acquired. The methods we are employing at these high elevations are applicable to rough grazings and to outrun grass land everywhere. This is a point of considerable significance, though apt to be entirely overlooked. More than this, if for any reason whatever Great Britain does at some future time elect to make the maximum use of her land area, it is of the greatest importance to have some idea of what that maximum may be. As there is so much land in Britain above the 1,000 ft. contour, an inquiry to ascertain its potential usefulness would seem to be a very obvious need.

It is necessary to have said this much as to our major aim because a good many people appear to be at a loss to understand why we have concentrated on difficult hill land. We have concentrated upon the most difficult task for the simple reason that it is the most difficult. For this reason we shall undoubtedly learn more that will be of value to everybody concerned with the improvement of grass land (grass land no matter where, and no matter of what type) than if we had tackled some perfectly easy proposition where success would have been a foregone conclusion.

If we are assuming that land standing at 900 ft. to 1,800 ft. above sea level is economically improvable it may well be asked what grounds we have for this assumption. First, there is the revolution in transport facilities, with the result that, by the aid of the caterpillar type of tractor, fertilizers can be carried almost anywhere, and implements brought to bear on these hills. Secondly, there can be hardly a doubt that methods for drying grass will be perfected and made economically feasible. That is the machine side, and all phases of agriculture must inevitably yield to the inexorable dictates of this, the machine age. On the plant side, we have a good many years of investigation behind us. The poor productivity of hill grazing is not only a matter of climate, but of low fertility and low fertility-demanding species of grasses and of lack of legumes. These are matters that our experiments have shown can be rectified.

Finally and crucially, there is the animal side, the type of animal products demanded and their standardization, and

THE CAEN HILL-IMPROVEMENT SCHEME

the health of the animals and the number that can be maintained. The big problem is wintering. This problem of wintering is not merely a hill problem; it affects the lowlands in a fundamental manner. The large-scale wintering of hill sheep in the lowlands is welcome enough to the lowland farmer because it is easy money. This over-grazing of the lowland pastures during the winter and early spring, however, is desperately bad for the lowland grass lands, and, possibly for the health of the lowland stock, and it reacts against higher and more intensive methods of farming. Moreover, the wintering afforded by this method to a large proportion of the hill sheep cannot by any stretch of the imagination be regarded as particularly satisfactory.

Our aim then is to show that hill districts can be made altogether more self-contained than they are at present. We have advisedly taken a high datum line (900 ft. above sea level) since to take a low datum line would, in any event, be to prove next to nothing.

Our endeavour will be, by the improvements we shall enact and by our methods of husbandry, to winter the maximum possible number of our stock on our own hill land (i.e., above our datum line) and to fatten the greatest possible number of lambs and wethers on our own lands. In order to maintain the grazings in good condition, it will be necessary to run cattle and ponies on the hills in the summer and to winter the largest possible head of cattle—aided to the maximum extent by fodder produced on our own lands, and therefore of course above our datum line.

The unit of which possession has been taken.—The land of which possession has been taken falls into three definite blocks.

(1) There is first the headquarters farm land, a fairly typical hill farm, mostly in grass, of 88 acres. This is Pwllpeiran, the home farm of the Hafod Estate behind Devil's Bridge and 16 miles from Aberystwyth. With, and as a part of, Pwllpeiran are 74 acres of woodland, which afford a certain amount of grazing, and 195 acres of hill. With the Pwllpeiran land and adjoining the Pwllpeiran hill we have also taken Prignant, which gives us about 17 acres of additional farm land and a further 400 acres of hill. Pwllpeiran and Prignant together give us a block of land standing 900 ft. to 1,300 ft. above sea level. This block will be improved and managed with the object of producing the

THE CAHN HILL-IMPROVEMENT SCHEME

maximum of wintering and of fattening the maximum of lambs and wethers. It constitutes our "lowland," the greater proportion of it not standing higher than 1,200 ft.

(2) The second block of country, "The Whitton Charity and Monument Land," is situated in Radnorshire near Knighton, about 54 miles from Pwllpeiran. This stands at 1,100-1,200 ft. above sea level and comprises about 120 acres. The vegetation is Bent-Fescue pasture, with large areas of Bracken and Gorse. It has, in the past, been let off in "grass lets," the whole area earning about £30 per annum. We shall probably convert this into valuable wintering with areas for fattening lambs.

(3) The third block is Nant Rhys, a mountain sheep walk of 2,200 acres standing at 1,500-1,800 ft. above sea level. This block is 5 miles from Pwllpeiran, and represents difficult and not readily accessible land with a wide range of moorland types of vegetation.

In the past, and on an average, it has carried a summer population of about 2,000 sheep and lambs, and a certain number of ponies. About 500 lambs every year have been sent from Nant Rhys to winter in the lowlands.

The Working Plan.—In all, we have taken possession of about 3,000 acres of land. A large unit was a necessity if far-reaching results were to be obtained. It must be explained that the Scheme is self-contained, and, as far as administration is concerned, is quite independent of the Welsh Plant Breeding Station, being wholly financed by Sir Julien Cahn's generous benefaction and other donations.

It is no concern of the Scheme to conduct detailed research. The whole thing is a large-scale economic experiment. Since we are breaking new ground at every turn, a certain amount of experimentation relative to details cannot at first, however, be avoided. This is necessary in particular with reference to implements, schemes of manuring, seeds mixtures and methods of preserving summer grass. Experimenting as such, however, will be kept distinct in relation to the costing accounts.

Our working plan is clear-cut. It consists in brief of (1) producing the maximum amount of winter fodder (in terms of grass and other crops *in situ* and hay, corn and preserved grass) from the farm lands; (2) converting selected portions of the "lowland" hill (Pwllpeiran and Prignant) into additional farm land; (3) re-grassing and improving as

THE CARM HILL-IMPROVEMENT SCHEME

much as possible of the rest of the lowland hills (Pwllpeiran, Prignant and the Whitton land); and then (4) improving the grazing on large and carefully selected blocks on the Nant Rhys mountain walk.

Preliminary Work.—We may now give a brief outline of some of the more interesting things we have so far done on the Pwllpeiran lands, of which we took possession on Lady Day, 1933,* for already we have exceedingly informative indications of what may be possible.

(1) *The Production of Short-Duration Forage Crops.*—On the farm lands we sowed two fields (24 acres in all) in oats with Italian rye-grass. We started grazing one of the fields on September 26 and the other on December 23 last. Although standing at over 900 ft., these fields (manured with basic slag and nitro chalk) are producing a wonderful lot of valuable winter keep. Cattle were frequently turned on one of the fields till Christmas and both fields afforded sheep grazing until the spring had fairly started. It is our intention to disc or rototill these fields next June and re-sow with Italian rye-grass. We propose to make very considerable use of Italian rye-grass, and at as high an elevation as proves to be practicable. We put another field into drills of timothy (the Station strains S.48 and S.51). Such drills give a very large amount of green winter keep, and they have already proved invaluable during periods of snow. In this connexion an interesting point arises. On this particular field, which proved to be overrun with Redshank (*Polygonum persicaria*), we had great difficulty in establishing the drills. Next year we shall not endeavour to establish drills on old farm land—which is all weed-seed foul—but we shall do so on the new areas which we have reclaimed from the hill which are weed-seed free.†

On the Pwllpeiran hill we are able to “intake” considerable areas. It is our intention on such “intaken” areas to grow, perhaps continuously year after year, such fodder crops as hardy green turnips, rape, Italian rye-grass and our winter-green pedigree grasses in drills. Reference may be made to a particular “intake.”

* We only took possession of the remaining lands at Michaelmas, 1933.

† We are making a buried weed-seed survey of the whole area of land of which we have taken possession. Such a survey gives extremely important evidence alike from the scientific and practical points of view. A report on the Pwllpeiran lands is now in preparation.

THE CAEN HILL-IMPROVEMENT SCHEME

During the last week in June, 1933, we tractor-ploughed a piece (about 7 acres) of rough bent-fescue pasture standing at 1,100 ft. above sea level. This was sown out on July 21 with hardy green turnips, receiving 10 cwt. per acre of low-grade basic slag at the time of sowing, and 1 cwt. nitro-chalk subsequently.

Despite the drought and the elevation, a very fair stand of hardy green was obtained.

It was not until December 22 that we proceeded to convert the turnips. We bought in 70 wethers, which, after a preliminary run over some rape on one of the farm fields, were finished off on the hardy greens. That these hardy greens, handicapped first by drought and then by snow and frost, and standing at 1,100 ft. above sea level, could be used to good advantage during December and January is decidedly significant, and not a little hopeful in relation to our intentions.

We may again emphasize the absolute weedlessness of these "intaken" areas, one result being that it will be possible to re-sow them, either in further catch crops or for long-duration sward, merely by the adoption of surface cultivations. It will be a matter of high economic importance to ascertain how many fodder crops can be taken off such areas without resort to a second ploughing.

(2) *The Production of Improved Grass on the Hills.*—Four main methods are being adopted. They are (a) to sow down "intaken" (ploughed) areas after a preliminary period of catch cropping; (b) to plough up the old sod and sow down immediately to grass; (c) to adopt surface methods of cultivation and to sow down; and (d) to start by manuring only and subsequently to sow white clover on these manured areas.

In the last resort and provided that animal products stabilize at a reasonable level, everything will depend upon the wisdom we display in the selection of areas as appropriate to the several treatments. Herein, as far as ultimate benefit to the whole hill farming of the country is concerned, lies the importance of the great number of vegetational types of which we have possession. Being pioneers, we are bound to make mistakes, and are compelled, if we are ultimately to succeed, to try what may appear to be the most unlikely methods on the most unlikely situations.

We have already ploughed some 40 acres on the Pwllpeiran hill; we have dealt with some 35 acres by methods

THE CAHN HILL-IMPROVEMENT SCHEME

of surface cultivation, and have put down 6 acres in 3 separate blocks under manures only.

The rainfall in the summer of 1933 was phenomenally low, even on the hills, but none the less quite satisfactory "takes" were secured, despite but little protection from the sheep. Mists and heavy dews have their compensating advantages!

The methods employed and the type of seeds mixtures used have been described elsewhere,* while a detailed report on the results of the hill experiments conducted by the Welsh Plant Breeding Station since 1930 is now in preparation.

We may usefully conclude this review by making reference to two exceedingly important matters upon which we have gained valuable experience during the past season. We refer to white clover and to implements.

White Clover.—Everything depends on our being able to establish wild white clover—calcium-efficient, protein-efficient and purveyor of nitrogen—and to this end inoculation is proving to be essential on many areas. In collaboration with Dr. Thornton of Rothamsted we are now testing a number of cultures with results that are of high promise.⁴ We have sown alsike clover on typical peaty areas and it has taken exceedingly well, establishing itself more quickly and more vigorously than white clover.

Both alsike and white clover are rendered noduliferous by the agency of the same bacterium, and it is therefore at least highly probable that a vigorous growth of alsike (resulting from inoculated seed) will tend to propagate the organism to the future benefit of the much more important white clover.

We mean to make observations on this, and next spring shall include cheap alsike clover in all our sowings—and shall also sow alsike on areas devoted to Italian rye-grass, rape and hardy green turnips preparatory to the time when sward mixtures will be sown on such areas.

Implements.—It will probably serve a useful purpose if we narrate our experiences with implements up to date.

All our work has been done with the "Caterpillar" tractor; we are using the "Fifteen" and "Twenty" models. We use Ransomes' ploughs. On bent-fescue pastures, devoid of large stones and rocks, the three-furrow "Midtrac" has done excellent work. On stony and rocky

* See references 1, 2 and 3, p 550

THE CAHN HILL-IMPROVEMENT SCHEME

ground, and on heavy peat, the large two-furrow "Juno-trac," of extra-strong construction and high clearance, and fitted with steel shares, seems likely to solve a difficult problem.

Of scratching and tearing implements of different degrees of fierceness, we have done good work with Ransomes' "Baronet" disc; the "Austral" roto-cultivator and the "Fishleigh" roto-cultivator; Wilder's "Pitch-Pole" harrows; the "Whakatane" harrows and "Perfect" harrows from New Zealand; and the Aitkenhead harrow. The "Ogle" grass chain-harrow—an excellent type of flexible harrow—has proved a very good covering implement for seeds on scratched areas; it is also useful, as it clogs not at all, for turning and drying roughage pulled up by scratching and dragging implements prior to drawing such material into windrows as a preliminary to burning. The best way of dealing with such roughage presents interesting problems. The ordinary brush road-sweeper has proved rather surprisingly effective for matter that is not too turfy; while for more turfy matter Ransomes' rotary scraper (an implement normally used by road contractors) seems likely to have considerable application. For making a tilth on an upturned sod the Ogle-spiked roller, followed by the "Ogle" grass chain-harrow has proved to be the best and most expeditious combination. For broadcasting our seeds we have used a "Bon Accord" disc broadcast seed sower, an implement which also broadcasts light dressings of nitro-chalk to perfection. The main bulk of the manures has been distributed by Bamford's "Supreme" Manure Distributor.

The whole question of implements is one that presents innumerable problems, and it is with the utmost satisfaction, as it is an excellent augury for the future, that we have to acknowledge valuable assistance both in technical advice, and in a willingness to modify models, from all the implement firms with whom we have had dealings, while in many instances we have also to acknowledge a material reduction in price in the interests of the work. This is not all, for the manure manufacturers have also shown a commendable faith in our undertakings by presenting us with fertilizers. Thanks are particularly due to Messrs. Imperial Chemical Industries, Ltd., who have displayed the greatest measure of faith; substantial aid has also been given by, and proportionate thanks are due to, Messrs. British Basic Slag,

THE CAHN HILL-IMPROVEMENT SCHEME

Ltd., and Messrs. The United Potash Co., Ltd. Material assistance has also been given by the seed trade, and our thanks are in no small measure due to Messrs. Gascoyne, Son and Buckland, Worcester; Messrs. James Carter, Raynes Park; Messrs. Gartons, Ltd., Warrington; Messrs. Sutton and Sons, Reading; and Messrs. Hunter, Chester. The farmers too have shown themselves far from lacking in faith; all have displayed interest. Some have wanted us to come and "experiment" on their land, some have already desired to hire our tractor and implements.

The Cahn Hill-Improvement Scheme, itself a matter of faith, is a gigantic experiment, let there be no doubt about that. Let there be no doubt, too, that the Scheme, come what will, is well and truly launched, and that it has within itself a considerable momentum.

REFERENCES TO LITERATURE.

- ¹ Stapledon, R. G. Improvement of rough and hill grazings. I. General Review. *Jour. Min. Agric.*, **38**, 1109-13, February, 1932. II. Application of manures supported by heavy grazings. *Ibid.* 1215-22, March, 1932. III. Sowing seeds, cultivation and manuring. *Ibid.* **39**, 36-46, April, 1932.
- ² Stapledon, R. G. *Climate and the improvement of hill land. Four Addresses on the Improvement of Grassland.* Pp. 27-36. Aberystwyth, 1933.
- ³ Stapledon, R. G. *An account of the organisation and work of the Welsh Plant Breeding Station from its foundation in April, 1919, to July, 1933.* Aberystwyth, 1933.
- ⁴ Poulter, A. A. Deficiency of the clover nodule organism on some Welsh soils. *Welsh Jour. Agric.*, IX, 145-159, 1933.

THE DEVELOPMENT OF SCAB IN STORED APPLES

H. WORMALD, D.Sc., A.R.C.Sc.,
Research Station, East Malling, Kent.

COMPARATIVELY little attention has been given to the appearance of apple Scab on the fruit during the storage period, although in recent years some interest in this phase of the disease has been roused in America and on the Continent.

Scab spots that develop on apples during storage are so unlike the ordinary Scab lesions that they may easily be mistaken for some form of "functional" spotting; it is therefore desirable that the grower should be able to recognize this form of the disease.

Instances of severe storage Scab came to the notice of the writer during last winter. In the middle of February (1934), a grower brought to the East Malling Research Station a Bismarck apple very badly spotted. The spots were of three types, viz.: (a) saucer-shaped, shiny, jet-black depressions with their margins fairly sharply defined; (b) superficial dark brown spots showing lobed growth, with irregular margins and (c) very small dot-like "pin-head" spots just visible to the naked eye. When examined with a lens some of the sunken spots were seen to bear definite raised pustules that proved to be conidial fructifications of the Scab fungus (*Venturia inaequalis*).

The largest individual spots were about one-eighth of an inch in diameter, but in places they were so numerous that they became confluent, forming large sunken blackened areas up to three-quarters of an inch in diameter (Fig. 1). As in such areas the individual spots were ill-defined, they could not be accurately counted, but it was estimated that on this particular apple there were altogether over four hundred infection spots. There were no spots such as are often seen on apples when put into store, so that it would seem that all the spots on this specimen had actually become visible only during storage.

The grower was asked for further samples, and towards the end of the month other apples from the same batch were received. These showed the same kind of spotting;

Dry Rot and Scab in Storage Apples

they were not so severely affected as the first specimen, but in addition to the three types of spotting mentioned above they bore a few Scab spots of the ordinary type, similar to those commonly seen on marketed apples. These ordinary Scab spots were brown or grayish, with a dark margin and a corky surface. The grower stated that the apples had been "picked in misty weather and came in slightly damp. They were graded after about a week to National Mark Fancy Grade and stored in orchard boxes in a brick building on a clay floor." He also said that this infection was not found on Bramley's Seedling nor any other variety stored under the same conditions.

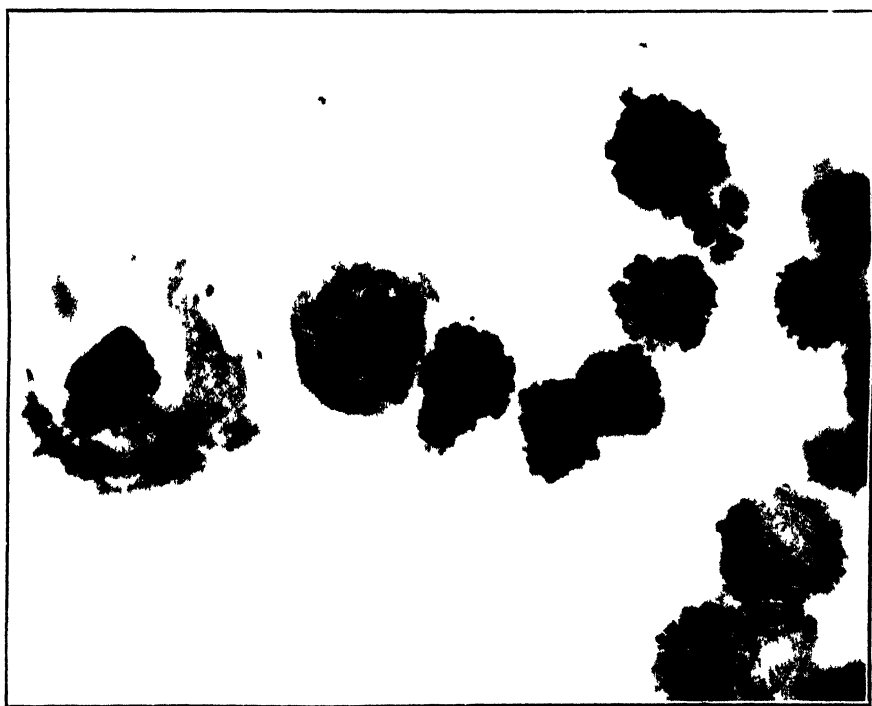
Scabbed Bismarck apples, obtained for comparison from a private house where they had been stored in the cellar, were very different in appearance. The Scab spots were larger (up to half-an-inch in diameter) and corky, many with small cracks, brown, with a darker marginal zone, and they were not definitely concave and saucer-shaped as in the larger storage Scab spots. These were evidently the original spots that were present when the apples were picked, and there was no reason to suppose that, in this case, any of the spots had arisen after the fruit had been stored; there were no pustules or spores on these spots, which were apparently quite barren.

Early in March another batch of Bismarck apples, also showing storage Scab, was received from another locality. Again the spots were mostly jet-black, saucer-shaped and very numerous; on the whole, they were larger than those of the specimens examined earlier, many of them being about one-fifth of an inch in diameter. They were confluent in places, forming large irregular black areas, and sometimes they were in series, forming lines; on one apple there was a continuous line of spots, one and a half inches long, besides shorter lines and many scattered spots (Fig. 3). At the stalk end of the same apple there were numerous very small spots consisting of branched (dendritic) lines, forming a kind of close network. Fig. 4 shows this condition as seen with a hand-lens. The larger spots again were concave and bore Scab pustules. The grower said that Newton Wonder and Bramley's Seedling apples stored in boxes near the Bismarcks were not affected.

The occurrence of spots in series suggests that spores had been carried and deposited by something moving in lines; there are two possible explanations: (a) that spores were



FIG. 1. Bismarck apple with very severe storage scab.
Taken from store in the middle of February.



Photos Dr I. Vormald.

FIG. 2. A portion of the apple in Fig. 1 as seen with a pocket lens ($\times 6$),
showing the larger spots with pustules.

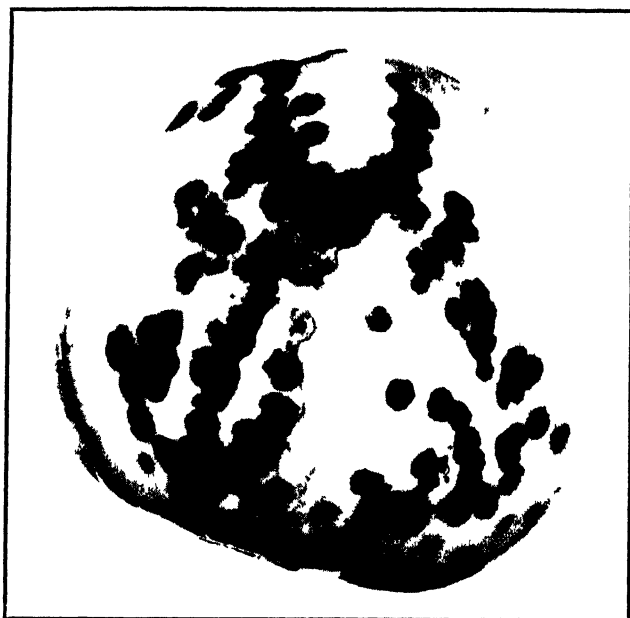


FIG. 3. A Bismarck apple with storage scab.
Taken from storage culy in March.

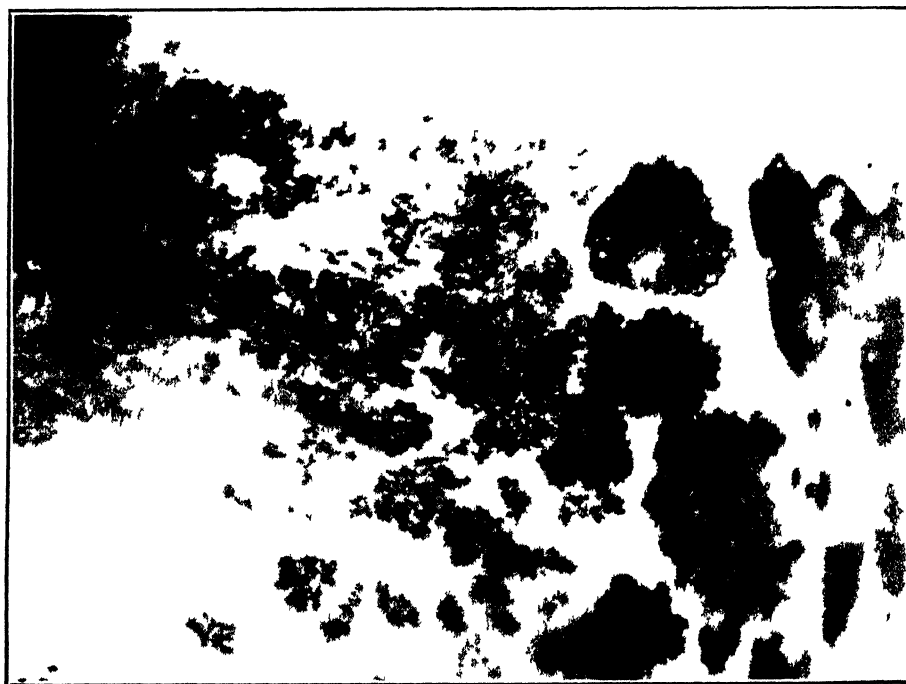


Photo: Dr. H. Wormald

FIG. 4. Portion of the stalk end of the apple in Fig. 3 as seen with a lens ($\times 6$) showing numerous small lesions forming in irregular network.

Development of Scab in Stored Apples

carried in drops of water flowing over the surface, or (b) that they were carried by crawling insects.

A microscopic examination of the sunken spots showed that there was in each a thin pad consisting of fungal cells beneath the cuticle. On some of the spots it was seen that from this pad the fungus had developed cushion-like outgrowths that burst through the cuticle, appearing at the surface as pustules. These pustules had the dense (stromatic) structure associated with those Scab fungus fructifications that often develop on apple twigs, and at the surface they bore slipper-shaped spores that were recognized as belonging to the *Fusicladium* stage of the apple scab fungus *Venturia inaequalis*.

There was no doubt therefore that these circular, jet-black, sunken spots were Scab lesions, although they were so different, in general appearance, from the spots so common on the young and on the maturing fruit on the tree.

No spores were seen on the smaller, more superficial, lobed spots, but these, too, were shown to be undoubted Scab spots by transferring particles from them to culture plates. These particles grew out and produced fungal cultures that developed *Fusicladium* spores, thus confirming their identity with the Scab fungus.

It is evident, therefore, that the type of injury here described is a result of infection by the Scab fungus, and that such spotting appears after the fruit is picked. It will be obvious, too, that an apple such as that shown in Fig. 1, if of "Fancy" grade when stored, must have been free or almost free from visible spotting.

Whether storage spotting arises from infection during the storage period, or whether it results from previous infection, invisible at the time of fruit picking, but after an "incubation" period producing visible spotting, is a debatable subject, and evidence has been brought forward by different observers in support of each point of view.

It may well be that such severe infection as is here described arises primarily from infection before storage, but followed later by further infection that occurs during the storage period. From the condition of the apples shown in the accompanying illustrations, it is almost incredible that the amount of infection present could have been initiated while the fruit was still on the trees. The spots were found in all stages of development, from minute specks

DEVELOPMENT OF SCAB IN STORED APPLES

to spots one-fifth of an inch across, as late as the beginning of March. Some of the larger (presumably the older) spots produced pustules during storage, and it is possible that spores liberated from the pustules were responsible for the infection seen as "lobed" spots, or for the minute "pin-head" spots. It is evident that the apples had been stored under conditions particularly favourable for the development of the Scab fungus, and the variety Bismarck is known to be very susceptible to Scab infection. However, there appears to be no experimental evidence that Scab infection can start under storage conditions, and Miss K. H. Johnstone, working at Long Ashton, obtained no success in attempts to infect storage apples with spores of the Scab fungus.⁶

Observers in America and on the Continent have demonstrated that Scab lesions may appear during storage; and it is certain that the lesions are, in many cases, the result of infection that has taken place before the fruit is picked. Folsom,⁴ in America, found "that the storage form of scab could be apparent to the camera at packing time while not evident to the naked eye." Weismann,¹⁰ in Germany, saw storage Scab spots by means of the microscope while they were still invisible to the naked eye. He marked some of these spots and found that after the fruit had been stored ten weeks the spots had become 0.5 cm. in diameter.

During the last five years storage Scab appears to have been prevalent in certain districts on the Continent, viz., in Germany, Austria, Russia, and Switzerland. Fischer³ mentions its frequent occurrence in Austria in recent years. Laubert,⁷ in Germany distinguishes storage Scab from ordinary summer Scab, and from autumn Scab (when the disease appears suddenly on hitherto sound fruit) by the sunken pitch-black shining spots. Other German observers who have written on storage Scab are Rothe,⁹ Loewel,⁸ and Frickhinger.⁵

Interesting observations were recently made by Faeß and Staehelin¹ in Switzerland. They carried out experiments in which apples were stored, when apparently quite sound, on November 16. In one series, apples in ordinary storage showed 71 per cent. scabbed on February 6. In a corresponding series the apples were wrapped in oiled paper, but again 69 per cent. became scabbed by February. They also obtained data² showing that the fruit from trees that had been sprayed with Bordeaux mixture contracted less

DEVELOPMENT OF SCAB IN STORED APPLES

Scab in storage than the fruit from trees sprayed with lime-sulphur.

For the control of storage Scab, a late spray is generally recommended. Growers usually try to avoid late spraying because of the deposit that may remain on the fruit at picking time. The three or four ordinary routine applications of Bordeaux Mixture or lime-sulphur should generally be sufficient to keep scab within reasonable control throughout the season; but during a wet summer, or when the earlier sprayings have not provided adequate protection, a late application of colloidal sulphur or a sulphur dust would tend to minimize late infection.

Picking and storing apples during rainy weather should be avoided. If it is necessary to pick apples while they are wet, the surface moisture should be allowed to evaporate before the fruit is finally boxed.

Summary.—Scab spots may appear during storage on apples that are apparently quite sound at the time they are picked.

These storage Scab spots are different from the ordinary Scab spots seen on fruit before storage, in their absence of cork, and in the sunken, saucer-shaped form and shiny black colour of the larger spots; the smaller spots are more superficial and usually lobed.

The larger spots may produce pustules bearing spores.

To avoid storage Scab, routine spraying must be a regular practice, and if necessary a late application of a fungicide must be made. Apples should not be stored when they are wet.

REFERENCES.

- ¹ *Faes, H. et Staehelin, M.* L'apparition et le développement de la tavelure tardive sur les pommes de garde. *L'Annuaire agricole de la Suisse*, 1931, pp. 167-201.
- ² *Faes, H., Staehelin, M. et Bovey, P.* Les traitements effectués contre les parasites des arbres fruitiers, insectes et champignons en 1930 et 1931. *L'Annuaire agricole de la Suisse*, 1933, pp. 17-77 (Observations on "tavelure tardive" described on pp. 51-53).
- ³ *Fischer, R.* Über Spätschorfbefall der Äpfel. *Bundesanstalt für Pflanzenschutz*. Mitt. nr. 198, 1929.
- ⁴ *Folsom, D.* Apple Spraying and Dusting Experiments 1928 to 1932 in Relation to Scab, Yield, and Tree Growth. *Maine Agric. Exp. Sta.*, Bull. 368. Nov., 1933, pp. 417-501. (Storage Scab discussed on pp. 479-481.)
- ⁵ *Frickhinger, H. W.* Der Lagerschorf und seine Bekämpfung. *Die Kranke Pflanze*. X, 1, pp. 6-8, 1933.
- ⁶ *Johnstone, K. H.* Observations on the varietal resistance of the apple to scab (*Venturia inaequalis* Aderh.) with special refer-

DEVELOPMENT OF SCAB IN STORED APPLES

ence to its physiological aspects. *Jour. Pomol. and Hort. Sci.*, IX, 1931, pp. 30-52.

⁷ Laubert, R. Zwei Fleckenkrankheiten der Winteräpfel. *Obst- und Gemüsebau*, LXXVI, 8, pp. 129-130, 1930.

⁸ Loewel, E. L. Das Auftreten des *Fusicladiums* im Altländer Obstbaugbiet in seiner Abhängigkeit von Klima, Standort, Obstarten und sorten und seine praktische Bekämpfung auf Grund zweijähriger Versuche des Obstbauversuchsringes. *Angew Bot.*, XIV, 3, pp 233-277; 4, pp 283-333, 1932.

⁹ Rothe, G. Fusikladiumschaden an eingelagerten Früchten. *Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, XI, 4, pp. 27-29, 1931.

¹⁰ Wiesmann, R. Ueber Schorfbefall der Lageräpfel. *Schweiz Zeitschr für Obst- und Weinbau*, XXXIX, 26, pp 517-522, 1930.

A STUDY OF DAIRY HERD MANAGEMENT*

C. V. DAWE, M.Com.,

Advisory Economist, University of Bristol.

DURING the year October 1, 1932, to September 30, 1933, the Agricultural Economics Department of the University of Bristol co-operated with 24 farmers in keeping records of feeding, labour and milk yields relating to 891 cows. The year was divided into a winter period of seven months and a summer period of five months. The 24 herds, nearly all of which were Shorthorns, ranged from 10 to 137 animals, and in three instances the open-air bail system (with milking machines) was used, while three other farms used milking machines.

Although these 24 herds came under 24 systems of management it will be simpler to regard them as forming one large herd, and in this connexion possibly the first important point to be considered is the one of milk yields.

The total "herd" of 891 cows produced during the year 479,494 gallons of milk, which gives an average yield of 538 gallons—this figure being calculated over dry and suckling cows as well. Omitting these, numbering 227, and basing the milk output solely on the cows in milk, the average yield of the remaining 664 cows over the whole year came to 723 gallons. As one cow in every four was either dry or suckling, it will be appreciated that for farmers to maintain a steady output of milk from their herds they have to incur costs of feeding and labour on one-fourth of their herd for which there is no return (in milk) during the whole year. Such expenses must obviously enter into any calculations upon the cost of producing a gallon of milk. The following statement shows how the herd is made up for the three periods, whole year, winter and summer:—

	<i>Whole Year.</i>		<i>Winter</i>		<i>Summer.</i>	
	<i>No.</i>	<i>Per cent.</i>	<i>No</i>	<i>Per cent.</i>	<i>No.</i>	<i>Per cent.</i>
Cows in milk..	664	74	640	72	696	78
Cows suckling	44	5	43	5	44	5
Cows dry ..	183	21	208	23	149	17
	891	100	891	100	889	100

* See also detailed Bulletin issued by the University of Bristol.

A STUDY OF DAIRY HERD MANAGEMENT

The amount of calf-rearing done is small, so that for all practical purposes the credit that can be allowed under this head, as an offset to the cost of milk production, is insignificant. Even if one ignores these suckling cows, the proportion of the whole herd that is always dry is about one-fifth.

While in both winter and summer the proportion of cows suckling is 5 per cent. of the entire herd, there is a greater proportion of the herd in milk in summer than in winter, and this difference is accounted for by the dry cows, for though there is only about one-sixth of the herd dry in summer there is almost one-quarter dry in winter, and this greater proportion must have the effect of still further adding to the costs of winter milk production.

Yield per Cow per Day.—The records obtained from these 24 farms enable the average daily yield to be stated. It is not possible to give the yield for any one particular cow, but only the yield of the "average cow" in the herd. This figure is given below, first as an average of the cows in milk, omitting those dry and suckling, and secondly as an average over all cows:—

<i>Combined Herd.</i>	<i>Daily Yield of the Average Cow.</i>		
	<i>Whole Year:</i>	<i>Winter:</i>	<i>Summer:</i>
	<i>365 days.</i>	<i>212 days.</i>	<i>153 days.</i>
	<i>gal.</i>	<i>gal.</i>	<i>gal.</i>
Cows in milk only ..	1.98	1.87	2.12
All cows	1.48	1.35	1.66

Thus, taking the whole year, the "average cow" in milk does not quite reach two gallons a day, and only in the summer period does it slightly exceed this figure. When the dry and suckling cows are included the yield falls to slightly under $1\frac{1}{2}$ gallons a day for the year.

Replacement of Cows.—One important item in the production of milk is the cost incurred under the heading of depreciation of the cows. Of the 24 farms in this inquiry, 17 showed depreciation costs ranging from 5s. to £6 13s. per cow in herd, i.e., cows in milk plus dry cows. Six farms showed an appreciation ranging from 16s. to £3 7s. per cow, while the records from the remaining farm were not sufficiently complete to enable a calculation to be made.

There were 852 cows on the 23 farms for which depreciation or appreciation can be calculated, and their total valuation was £17,424 10s. During the year the deprecia-

A STUDY OF DAIRY HERD MANAGEMENT

tion amounted to £2,162 9s. 11d. without giving any credit for calves, and this is equivalent to a rate of 12·4 per cent. per annum. When credit is given for calves,* whether sold or retained in the herd, the total figure for depreciation falls to £1,017 9s. 10d., equivalent to 5·8 per cent. per annum.

Heifers transferred into the dairy herd were valued at the farmers' own figures, and the same method was adopted when cows were transferred out of the herd to be fattened. Cows purchased or sold were debited or credited at the cash price.

As an item of cost in the production of a gallon of milk, depreciation cannot be ignored. The seventeen farms previously referred to as having a depreciation charge per cow, show a range from 0·14d. to 2·64d. per gallon, while the six farms showing appreciation, range from 0·35d. to 2·02d. per gallon. Regarding the 852 cows on the 23 farms as one large herd, the average cost of depreciation amounts to 1·16d. per gallon when no credit is allowed for calves, or to 0·54d. per gallon when such an allowance is made.

Feeding Costs.—Space will not permit the details of feeding to be given, but the two following tables give a summary of the results calculated per cow and per gallon. In both tables the figures have been calculated over all cows:—

Cost of Feeding per Cow

Foodstuff	All Year			Winter			Summer		
	<i>lb.</i>	<i>£</i>	<i>s. d.</i>	<i>lb.</i>	<i>£</i>	<i>s. d.</i>	<i>lb.</i>	<i>£</i>	<i>s. d.</i>
Concentrates and grain	1624	5	2 0	1168	3	14 8	457	1	7 5
Hay	2726	3	13 7	2617	3	10 9	108		2 9
Straw (fodder)	51		8	49		8	3		--
Roots	905		4 1	898		4 1	7		--
Other foods	1466		11 1	1232		9 7	235		1 6
			9 11 5			7 19 9			1 11 8
Grazing			4 2 5			15 0			3 7 5
Total			13 13 10			8 14 9			4 19 1

The average yield per cow for these periods (including dry and suckling cows) is:—

All Year: 538 gal. *Winter*: 285 gal. *Summer*: 254 gal.

* Credit for calves sold is given at the actual selling price realized. Credit for calves retained is given at 30s

A STUDY OF DAIRY HERD MANAGEMENT

so that the quantities and values of foods *per gallon* are as follows:—

Average per Gallon.

Foodstuff	All Year.		Winter.		Summer.	
	<i>lb.</i>	<i>d.</i>	<i>lb.</i>	<i>d.</i>	<i>lb.</i>	<i>d.</i>
Concentrates and grain ...	3'02	2'27	4'10	3'15	1'80	1'30
Hay	5'07	1'64	9'18	2'98	'43	'13
Straw (fodder) ...	'10	'02	'17	'03	'01	--
Roots	1'68	'09	3'15	'17	'03	-
Other foods ...	2'73	'25	4'32	'40	'93	'07
		4'27		6'73		1'50
Grazing		1'83		'63		3'19
Total		6'10		7'36		4'69

It is useful to consider to what extent farmers ration their cows according to yield during the winter period, and the following table gives a summary:—

Winter Period.

Daily yield per cow. Gal.	Average weight of con- centrates per gal.	Number of farms.
	<i>lb.</i>	
$\frac{1}{2}$ and under 1	2'43	2
1 " " $1\frac{1}{2}$	4'35	11
$1\frac{1}{2}$ " " 2	4'09	9
2 " " $2\frac{1}{2}$	3'29	2

In connexion with this table it should be pointed out that nineteen different concentrates were fed on these farms, and, although they are not included in the above table, there were also ten different kinds of home-grown foods (excluding concentrates).*

Total Cost of Production.—So much attention has been recently focussed upon the cost of production of milk that the writer feels it essential to draw some conclusion from this investigation, although it should be stated that the inquiry was instituted primarily into systems of management on different farms and not to calculate costs per gallon.

The only item that can be regarded as thoroughly reliable in the cost of production is that for feeding stuffs.

* The relationship between theoretical food requirements and actual feeding is given in detail in the Bulletin referred to.

A STUDY OF DAIRY HERD MANAGEMENT

Labour records were only taken for four separate "test weeks" during the year, and the times calculated from these records show that the total labour required per cow per day amounted to 43 minutes in winter and 35½ minutes in summer. At the average yield of 2 gallons per cow per day this works out at 2.87*d.* per gallon in winter and 2.37*d.* per gallon in summer at the assumed rate of wages of 8*d.* per hour.

Depreciation of the herd is an invisible cost that accounts for 0.54*d.* per gallon when credit is given for calves. In addition to these three items of cost something must be included for the share of the general overhead expenses of the farm, which can be estimated at 1*d.* per gallon. Thus, so far, the costs of producing a gallon of milk can be put as follows, bearing in mind the reservations made above:—

<i>(Estimated) Cost of Production of 1 gal. of Milk.</i>		
	<i>Winter.</i>	<i>Summer.</i>
	<i>d.</i>	<i>d.</i>
Foods	7.36	4.69
Labour	2.87	2.37
Herd depreciation ..	0.56	0.45
Overheads	1.00	1.00
	11.79	8.51

Further, it must be pointed out that in these calculations nothing has been included for the risks inherent in agriculture (e.g., from climate, pests and diseases), for the remuneration of any manual work performed by the farmer himself, or for interest on the capital invested in the dairy herd and equipment. The profits due to the farmer for his enterprise or managerial ability can only be reckoned after these expenses have been included in the cost of production.

POTATOES IN PIG FEEDING

J. C. WALLACE, M.C., and J. K. THOMPSON, N.D.A.,
*The Agricultural Institute and Experimental Station,
 Kirton.*

THE results of a trial in the use of potatoes for pig feeding, conducted at Kirton in 1928, have already been reported in this JOURNAL.*

In that experiment, the progress of pigs in a control pen, fed on a balanced basal mixture of meals, was compared with that of pigs, in three other pens, fed on rations in which steamed potatoes replaced varying quantities of cereal fattening food up to, in one instance, its entire replacement, 4 lb. of potatoes being substituted for 1 lb. of meal. The much lower protein content of the potato, compared with the cereal fattening food, appeared to be a handicap, since the balance of the rations over the trial period was less favourable to the potato-fed pigs; and to this was attributed the fact that a diminishing rate of progress synchronized with increasing allowances of potatoes.

Further Trial in 1933.—It may be of interest, therefore, to record the results of a further trial in feeding potatoes to pigs, conducted at Kirton last year. On April 14, 16 gilts were selected out of 4 litters of Large White sows by a Large Black boar. The gilts had been raised on a well-balanced ration that included potatoes, and were 17-18 weeks old when the trial began. They were divided into 4 pens of 4 pigs each, the initial live weights per pig per pen being:—Pen 1, 91.5 lb.; Pen 2, 92.75 lb.; Pen 3, 92.25 lb.; Pen 4, 92 lb.

Feeding was based on two balanced meal mixtures, as under, which were fed successively to Pen 1, the control pen.

	Mixture A.	Mixture B.
	lb.	lb.
Extracted soya meal	12	5
Bean meal (home-grown beans)	—	5
Sharps	20	20
Barley meal	68	70
Carbonate of lime	2	2
Salt	$\frac{1}{2}$	$\frac{1}{2}$

The A mixture was fed from April 14 to May 7, and B mixture from May 8 to the end of the trial on June 20.

For the feeding of the pigs in the three other pens (Nos. 2, 3 and 4), steamed potatoes were introduced in replacement of the barley meal. In the ration fed to Pen 2, potatoes were substituted for about one-third of the barley meal in

* Vol. XXXVII, No. 3 (June, 1930), p. 263.

POTATOES IN PIG FEEDING

the control mixture; in the ration for Pen 3, about two-thirds of the barley meal was thus replaced; and for Pen 4, potatoes replaced the whole of the barley meal. Approximately, the substitution was at the rate of 4 lb. of potatoes for 1 lb. of barley meal; but this was not exact, since the soya meal was increased in each instance to maintain the protein equivalent of the control mixtures A and B.

All the pigs made satisfactory progress and at no time was there much to choose between them, although the pigs of the control pen (No. 1) carried more bloom than the others. Figs. 1 and 2 show, respectively, the pigs of Pens 1 and 4 on June 20, the day of despatch to the bacon factory, when the trial closed, as the supply of potatoes had been exhausted, although all the pigs were not quite up to bacon weight. The consignment to the factory included all the pigs of Pen 4, three of Pen 1, three of Pen 2, and two of Pen 3. The salient figures are given in Table I.

TABLE I.

<i>Pen</i>	<i>Daily live weight gain. lb.</i>	<i>Food consumption per lb Meal. lb.</i>	<i>Potatoes. lb</i>	<i>Live weight increase: Meal equivalent lb</i>	<i>Net cost of food per lb. live weight increase Meal.</i>
1	1 753	3 68	—	3 68	2-27d.
2	1 660	2-80	3 24	3 61	1 79d.
3	1 484	2 36	7-46	4 20	1 93d.
4	1 768	1 49	8 31	3 57	1 49d.

Table II shows the cost per pig per pen at the close of the experiment.

TABLE II.

	<i>Pen 1.</i>	<i>Pen 2.</i>	<i>Pen 3.</i>	<i>Pen 4.</i>
	<i>£ s. d.</i>	<i>£ s. d.</i>	<i>£ s. d.</i>	<i>£ s. d.</i>
*Initial cost per pig	2 10 0	2 10 0	2 10 0	2 10 0
Net cost of food per pig	1 1 11½	0 16 5½	0 15 9½	0 14 6½
Carriage to Bacon Factory	0 3 10	0 3 10	0 3 10	0 3 10
†Labour at 4d. per pig per week	0 3 2	0 3 2	0 3 2	0 3 2
Total cost per pig..	3 18 11½	3 13 5½	3 12 9½	3 11 6½
Number of pigs finished and sold	3	3	2	4

The pigs were sold at 10s. 6d. per score, dead weight, at the factory, and the weights were ranged in those defined as Class I in the Bacon Marketing Scheme.

* Actual purchase price. (The pigs were purchased when bacon pigs were 13s. per score, dead weight.)

† *Vide* "Work of the Harper Adams College Pig Feeding Experimental Station, 1926-31. Pig Feeding Report No. 1.

Potatoes in Pig Feeding

The use of waste and surplus potatoes did not effect so large an economy in feeding as in the earlier experiment, for the reason that the prices of concentrated feeding stuffs had fallen very considerably in the interval between the two trials, e.g., barley meal cost £7 per ton in 1933 as against £12 in 1928. The figures of Table I are interesting, particularly when compared with the corresponding figures of the earlier trial (see Table III).

TABLE III.

Pen.	Daily gain live weight.		Food consumption meal equivalent.		Cost of food per lb live weight gain.	
	1933 trial.	1928 trial.	1933 trial.	1928 trial.	1933 trial.	1928 trial.
	lb	lb.	lb	lb.	d.	d.
1	1 753	1 737	3 68	5·41	2 19	6 06
2	1 660	1·675	3 61	5 42	1 99	5 57
3	1 484	1 487	4 20	5 01	1·93	4 51
4	1 768	1·550	3 57	5 88	1 49	3 69

The pigs at both trials, although of the same breed, were not of the same age, those of the first trial being 20 weeks old at the start, and finishing at weights that to-day would fall into Class III. In both trials, the pen (No. 3) that received a moderately heavy allowance of potatoes made comparatively moderate progress. The figures for daily live-weight gain in the second test are fairly even, the pigs in Pen 4 (heavy potato ration) making as good progress as those of the control pen (No. 1—all meal); in the earlier trial, the addition of potatoes slowed up the rate of production. The figures for meal-equivalent consumption per lb. of live-weight increase are fairly even in the 1933 trial: in the 1928 trial, food consumption increased with increasing allowances of potatoes. The explanation may lie in the fact that, in the second trial, the rations were kept evenly balanced, the lower protein content of the potatoes being compensated by extra soya meal. Obviously, this is an important point in the practical feeding of potatoes.

The bacon curers reported the carcasses as satisfactory; although slightly greasy, and expressed no preference as between the hams from the different pens.

Conclusion.—The results of the 1933 trial confirm those of the earlier one; but they suggest that the potato has a greater value as pig feed than the 1928 trial indicated. It would seem that, in proper balance, the potato may be fed in large quantities with as great a nutritive economy as a

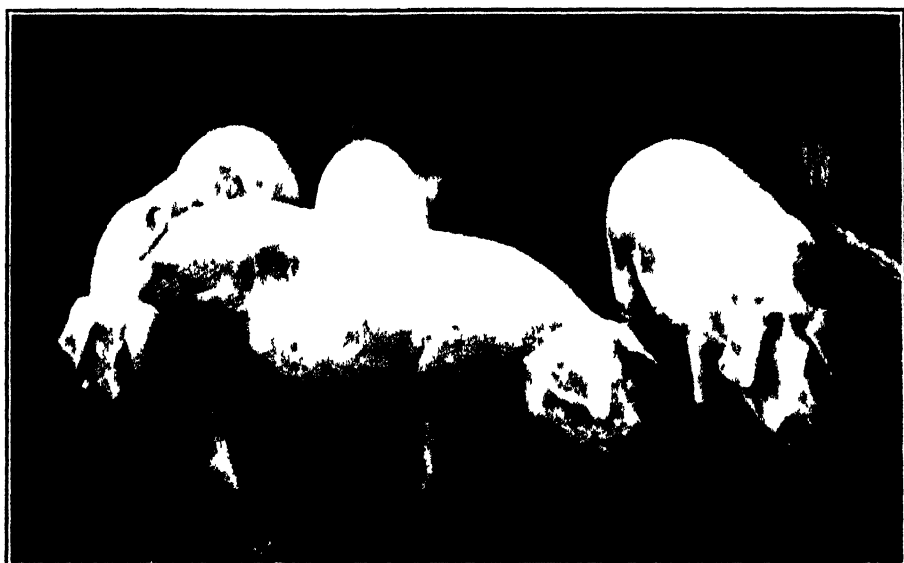


FIG. 1. The pigs in Pen 1 (control)



Photos J. C. Wallace

FIG. 2. The pigs in Pen 4 fed on a ration in which steamed potato
completely displaced barley meal

POTATOES IN PIG FEEDING

balanced ration of meal alone. One useful piece of additional information, derived from the lower age of the pigs at which feeding in the 1933 trial began, is that the potato can be fed as usefully in the production of small-weight (Class I) bacon pigs as in that of heavier-weight carcasses.

As regards cost of production, surplus potatoes offer a means of reducing feeding costs, although, in this connexion, it should be emphasized that these trials were not instituted to demonstrate the selling of the potato crop via the pig. In the Kirton area, however, large quantities of otherwise unsaleable potatoes are always available for feeding to stock; and their use in this direction is a matter of everyday concern and importance.

As already stated, 4 lb. of potatoes were roughly calculated as equivalent to 1 lb. of barley meal. As, however, potatoes tend to lose a little weight in steaming, presumably in the form of water, it is probable that a slightly smaller quantity than 4 lb. is the actual equivalent in potatoes of 1 lb. of barley meal.

MODERN DEVELOPMENTS OF ENSILAGE

H. E. WOODMAN, M.A., Ph.D., D.Sc.,
School of Agriculture, Cambridge.

DURING recent years of economic depression the use of tower silos has made very little headway in this country, since in many instances farmers have been unable to afford the expenditure associated with their erection. In consequence, numerous investigations have been carried out for the purpose of discovering practicable methods of controlling the processes of fermentation that occur when a green crop is ensiled. The object of this research has been to enable silage to be made in pits or other inexpensive containers with a greater degree of certainty, in respect of the quality of the product, than has hitherto been possible when dispensing with the tower container. The practical outcome of these investigations may be discussed under three headings.

(1) Control of Ensilage by Addition of a Sterilizing Agent.—The principle underlying this modification of the silage process is to seek to prevent fermentation of any kind by sterilizing completely the mass of green crop filled into a pit silo, thus enabling the fodder to be preserved in an almost unchanged condition. The method of direct sterilization is employed in the so-called Toro-silon process that has been worked out by Dr. Rojahn in Germany.

The procedure is to spread a 2-in. layer of chaff, for absorbing the Toro-silon solution, over the floor of the pit. The diluted Toro-silon solution, which contains the sterilizing agent in combination with alumina, is then watered on to the chaff and also down the sides of the pit by means of a watering can. About 1 kg. (2.2 lb.) of the proprietary solution, well diluted with water, suffices for about 5 tons of the green crop. The crop is then filled in and trampled well, and after final settlement, the pit is sealed with a layer of soil 2 ft. thick.

During the process of filling, a gas, that consists of a powerful sterilizing compound of sulphur dioxide and formaldehyde, is liberated and permeates the whole mass of material. The gas is said to be quite innocuous, but since

MODERN DEVELOPMENTS OF ENSILAGE

it is of a light nature and finally escapes entirely from the pit, there can be no question of any ill-effects resulting from the feeding of the resulting silage to farm stock. It is claimed that the use of the Toro-silon reagent inhibits bacterial fermentation and also prevents to a large extent the breakdown of protein by the plant enzymes, and that a superior product is obtained with very small losses.

Very few trials of this new method have been carried out in this country, so that it is difficult to form a reliable judgment of its merits. The writer, in conjunction with Dr. Rojahn himself and the authorities of the Wye Agricultural College, made a preliminary test of the process a year or two ago, ensiling lucerne, with and without Toro-silon, in pits cut out of the solid chalk. The results were disappointing. The use of the Toro-silon solution led to no detectable improvement in the quality of the lucerne silage; nor was there any evidence that the reagent was able to prevent the occurrence of the bacterial and enzymatic fermentations normally associated with ensilage as ordinarily carried out.

(2) Control of Ensilage by Stimulation of the Lactic Fermentation.—The type of fermentation that is most desirable in the conserving of green crops by ensilage is that in which lactic acid is produced by the action of lactic bacteria on the carbohydrate of the crop. It is of obvious advantage, therefore, to encourage the activity of this kind of micro-organism, the aim being to obtain as quickly as possible a concentration of 1-2 per cent. of lactic acid, in order to ensure the production of a palatable silage and to hold in subjection all other types of bacterial fermentation that might result in the formation of undesirable constituents, such as the foul-smelling butyric acid.

Since the lactic acid is produced from carbohydrate, it is clear that the addition of sugar, a very readily-assimilable form of carbohydrate, to the ensiled crop should predispose the changes in the direction of the desirable lactic fermentation. The effects of adding crude sugar during the filling process have been studied by German workers, and promising results have been obtained by its use at the rate of $\frac{1}{2}$ -1 lb. per 100 lb. of green fodder. The sugar is best sprayed on to the material in the form of its solution in water.

A more common way of adding sugar is to use molasses

MODERN DEVELOPMENTS OF ENSILAGE

diluted with water, and in this instance the quantities given above for crude sugar should be doubled. The molasses solution is sprayed on the green fodder, layer by layer, and if the usual precautions respecting consolidating and sealing off the silage are carefully observed, the method is said to give rise to silage of excellent quality. It offers special advantages in the ensiling of protein-rich fodders such as lucerne and young grass.

An interesting innovation has been introduced recently by the Reading Institute in this connexion. It consists of the addition of whey (or diluted whey paste) during the filling process in order to furnish the fermentable sugar, lactose. The presence of this compound ensures an active lactic fermentation, and very satisfactory results are said to have been obtained by this means.

(3) Control of Ensilage by Regulation of Acidity.—

The observation that the lactic acid formed during ensilage exerts a preservative action on the fodder has led to the suggestion of using acids, organic or inorganic, for raising the acidity of the ensiled crop to such a degree as to prevent fermentative action of all kinds. By such means it appeared possible to preserve green fodders with the minimum change and loss.

The best-known method depending on this principle is the A.I.V. process, so-named after its discoverer, Dr. A. I. Virtanen of Helsingfors. This is a patented process and has been subjected to critical examination in this country at the Jealotts Hill Agricultural Station during the last two years. It is claimed that the addition of a dilute solution of mineral acids in correct amount to the fodder during filling inhibits all detrimental breakdown processes and reduces the losses of nutrient to a very low level. The acid used is hydrochloric acid to which is added a small amount of sulphuric acid. In scientific terminology, the amount required is such as to bring the pH of the mass of fodder to between 3 and 4.

According to descriptions given by Dr. Watson of the Jealotts Hill Station, the A.I.V. silage is made in simple silos of a standard height of about 5 ft., with variable diameter and a removable over-silo of approximately 6 ft. in height. Free drainage of effluent is allowed for, since such juice is too acidic to be retained for feeding. The fodder is filled into the silo in layers of 4 to 6 in., every

MODERN DEVELOPMENTS OF ENSILAGE

layer in turn being sprayed with the required volume of dilute acid. It is important that the material should be compacted carefully and that the acidic solution should be added at a fixed rate. In the case of clover and other leguminous crops, it is recommended that about $2\frac{1}{2}$ gal. of the dilute acidic solution should be used for each 4 cwt. of fodder; for grasses, about $2\frac{1}{3}$ gal. and for kale and sugar-beet tops about $1\frac{3}{4}$ gal. If the crops are very dry at the time of ensiling, these amounts should be increased somewhat.

When both the under- and over-silos have been filled, a layer of paper or old sacks is spread on the top, and the material is then sealed by a soil covering of at least one foot in depth. The fodder settles without difficulty into the under-silo, and when the over-silo is removed, the soil covering should be made as air-tight as possible. The under-silo should be perfectly air-tight, and it is an advantage if it is sunk into the ground. If above ground, it is safer to bank up on the outside with soil. It is important to remember that moulds are apt to develop rapidly in fodder thus treated with acids, and for this reason a special anti-mould preparation, the chief ingredient of which is mustard oil, is sprayed on the surface before finally sealing with the soil layer.

Silage made in this way is said to have given great satisfaction to farmers in Finland, Holland and other parts of the Continent. Any risk of trouble with live stock from undue acidity of the material is guarded against by feeding $\frac{1}{2}$ lb. of a mixture of 4 parts of finely-ground chalk and 1 part of carbonate of soda to every 1 cwt. of the A.I.V. silage. Extensive trials of the process are being made in this country at the present time and the results are apt to be a little conflicting. It is perhaps too early, therefore, to pronounce finally on the merits or demerits of the method, and farmers who wish to test the process for themselves will do well to seek expert guidance before embarking on the experiment.

NOTE.—A comprehensive account of ensilage is given in the Ministry's Bulletin No. 37. (Price 1s. net, or 1s. 2d. by post, from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2).

MARKETING NOTES

The Milk Act, 1934.—A note in the issue of this JOURNAL for March last (page 1109) outlined the policy of H.M. Government in regard to milk, as announced by the Minister in the House of Commons on February 22, 1934. This policy has now been embodied in the Milk Act, 1934, which received the Royal Assent on July 31, 1934.

The earlier sections of the Act provide for Government advances in respect of manufacturing milk and milk made into cheese on farms. Registered producers, other than farm cheesemakers, are not directly concerned with these advances, which are paid direct to the Boards concerned; but they benefit to the extent of the increase in pool prices which results. Farm cheesemakers have to enter into an agreement with their Milk Board in order to benefit. The necessary administrative arrangements have been completed by the Board.

The Act is retrospective to April, 1934, and although no Exchequer payments have yet been made, the Board have already included in their pool distribution for April, May, June and July the sums estimated to be payable under the Act in respect of those months.

The campaign for a purer milk supply is in preparation. Details have not yet been made public, but it is understood that provision will be made for the establishment of attested herds from which all tubercular animals have been eliminated.

A further important provision of the Act relates to a Milk Publicity Campaign. During the passage of the Act through Parliament, the Minister gave an assurance that the bulk of this fund would be expended on a campaign for the extension of milk consumption in schools, and a Committee, as stated in the following paragraph, has been set up by the Milk Board to advise on this matter.

Advisory Committee on Milk Publicity.—The Milk Marketing Board has announced the appointment of the following committee to advise and assist in connexion with

MARKETING NOTES

the expenditure of money made available under Section 11 of the Milk Act, 1934, for increasing the demand for milk :—

Viscount Astor (*Chairman*).

Sir Harold Hartley, C.B.E., M.C., F.R.S.

Alderman Arthur Jenkins, Monmouthshire County Council.

Mr. F. Mander (Secretary to the National Union of Teachers).

Mr. J. B. Orr, D.S.O., M.C., M.D., D.Sc., F.R.S. (Director of the Rowett Institute for Research in Animal Nutrition).

Mrs. Ethel Wood, C.B.E., of the Food Council.

The Board have appointed Mr. F. E. Knight, an employee of the Board, to act as Secretary to the Committee.

The Committee held its first meeting on August 8.

Milk Marketing Scheme : Prices for July.—The wholesale contract price for liquid milk in July was 1s. 1d. per gallon in the South-Eastern Region and 1s. per gallon in all other regions. Owing to an improvement in the price of imported cheese, the manufacturing price for milk manufactured into butter or cheese or condensed milk increased by $\frac{1}{4}$ d. to $3\frac{3}{4}$ d. per gallon. The average price obtained for all milk going into manufacture was 5.67d. per gallon, as compared with 5.46d. in the previous month. Both figures include the Government advance payable in respect of manufacturing milk.

Regional pool prices and producer-retailers' contributions, compared with those for June, were as follows :—

Region.	Pool Price		Producer-Retailers' Contributions.	
	(Pence per gal.)		(Pence per gal.)	
	June.	July	June.	July
Northern ..	10 $\frac{1}{2}$	10 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$
North-Western	10 $\frac{1}{2}$	10 $\frac{1}{2}$	1 $\frac{7}{8}$	1 $\frac{7}{8}$
Eastern ..	10 $\frac{1}{2}$	10 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$
East Midland	10 $\frac{1}{2}$	10 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$
West Midland	9 $\frac{1}{2}$	10 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$
North Wales	10	10 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{7}{8}$
South Wales	10 $\frac{1}{2}$	10 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$
Southern ..	10 $\frac{1}{2}$	10 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$
Mid-Western	10	10 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$
Far-Western	10	10 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{7}{8}$
South-Eastern	10 $\frac{1}{2}$	11 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$
Average	10.25	10.52	1.56	1.43

Producer-retailers, who did not sell milk by wholesale other than on contracts carrying level delivery premiums, were credited with a level delivery premium of $\frac{1}{2}$ d. per gallon off the above contributions.

The inter-regional compensation levy was fixed at 1d. per gallon on all liquid milk sales, and the whole of the proceeds were distributed among the regional pools in proportion to the amount of manufacturing milk sold in each region.

A general expenses levy of $\frac{1}{4}$ d. per gallon on all wholesale

MARKETING NOTES

milk sales was charged in July; no such charge was made in June.

Sales of milk on contract were estimated to be:—

	<i>Gallons.</i>	<i>Per cent.</i>
Liquid milk	45,507,597	70.2
Manufacturing milk ..	19,371,953	29.8
	64,879,550	100.0

In addition, milk manufactured into cheese on farms was estimated to amount to 3,447,646 gallons as compared with 3,673,455 gallons in June.

Pigs and Bacon Marketing Schemes : *Price of Bacon Pigs for August.*—The price of the " basic " pig (Class 1, Grade C) for August, under the form of contract prescribed by the Pigs Board, was 11s. 6d. per score, a decrease of 1d. on the price for July.

Transport Arrangements.—Discussions have been held between the Pigs and Bacon Boards and the Railway Companies regarding the continuance of a national flat rate for pigs consigned to registered curers during the next contract period.

Potato Marketing Scheme : *Sales of Potatoes on Commission.*—Following the vote of a substantial majority of registered producers in favour of the abolition of sales of potatoes on commission, the Potato Marketing Board passed a resolution prohibiting such sales as from April 1, 1934, otherwise than sales through an authorized merchant in a place approved by the Board. Exceptions are to be made, in accordance with this resolution, in the case of approved auction markets, a list of which is in course of preparation. The resolution does not apply to seed or new potatoes or to sales in lots of less than 1 cwt.

Authorized Merchants.—The Board have considered a large number of applications for authorization as merchants and have published a list of authorized merchants.

Potato Acreage—June 4, 1934.—Preliminary census figures show that the acreage of potatoes in Great Britain on June 4 was 630,500 acres, a decrease of approximately 41,000 acres or 6.1 per cent. on 1933. This figure, which includes every area of $\frac{1}{4}$ acre and upwards returned as under potatoes, is necessarily higher than that recently published by the Potato Marketing Board, viz., 541,500 acres, which related only to the acreages registered by

MARKETING NOTES

growers of 1 acre or more of potatoes. Nevertheless, there was no material difference between the percentage decrease shown by both sets of statistics. The Potato Board figure showed a drop of 7·2 per cent.

With the exception of the Isle of Ely, where there was a small increase, the decrease in area was general, but was less marked in the Eastern Counties than over the rest of the country.

Beet-sugar Industry : Results of the 1933-4 Campaign.—A comparative statement is given below of the results of the beet-sugar manufacturing campaigns for the years, 1932-3 and 1933-4. The acreage, tonnage of beet, and yield per acre in 1933-4, the last campaign to be affected by the provisions of the British Sugar (Subsidy) Act, 1925, were the highest ever recorded in this country.

	1933-4.	1932-3.
Acreage under sugar-beet ..	365,774	255,648
Tonnage of beet delivered to factories	3,298,119	2,232,061
Average yield per acre (tons) ..	9 0	8 7
Average sugar content of beets (per cent.)	16 4	16 9
Average farm output of sucrose per acre of beet grown (lb.)	3,312	3,305
Average price paid per ton of beet	39s. 7d.	42s. 8d.
Estimated total sum, including cost of transport, paid by factories to growers	£6,528,000	£4,762,000
Number of beet growers	39,828	34,452
Number of factories	18	17
Average number of days worked at factories	107	80
Average number of workers employed in the factories during the campaign	9,000	8,100
Production of sugar (tons)	463,039	330,324
Average extraction of sugar expressed as a percentage of beets delivered to factories	14 0	14 8
Average extraction of sugar expressed as a percentage of total sucrose in beets	86	88
Average factory output of manufactured sugar per acre of beet grown (lb.)	2,836	2,894
Production of by-products:—		
Molasses (tons)	*127,600	78,441
Pulp:—Dry (tons)	244,490	159,791
Wet (tons)	77,284	25,296
Subsidy paid:—		
Sugar	*£3,008,000	£2,145,932
Molasses	*£379,000	£232,847
Total	*£3,387,000	£2,378,779

* Provisional.

MARKETING NOTES

The Fat Stock Direct Consignment Schemes.—The schemes continue to progress. During July, a total of 378 cattle, 4,904 sheep and lambs, and 11 pigs were dealt with under the schemes at the various grading centres, making totals to July 31 last of 7,336 cattle, 27,307 sheep and lambs, and 662 pigs.

In conjunction with the Welsh Agricultural Organization Society, arrangements were recently completed for receiving bulk consignments of lambs from South Wales under the dead-weight and grade scheme. Thirteen group agents have been appointed and the procedure is similar to that adopted for North Wales (see June, 1934, issue of this JOURNAL). The first bulk consignment of lambs from South Wales was received at Birmingham Wholesale Meat Market on July 15.

Wheat Act, 1932: The New Quota Payments Order.—The Minister, on the recommendation of the Wheat Commission, has made orders in pursuance of the powers conferred upon him by the Wheat Act, 1932, altering the amount of the quota payment that every miller and every importer of flour shall be liable to make to the Wheat Commission in respect of each hundredweight of his output of flour, and giving the estimates upon which the new rate of quota payment is based.

The first of these Orders (The Wheat (Anticipated Supply) No. 2 Order, 1934) prescribes the quantity of home-grown millable wheat of their own growing, which the Minister anticipates will be sold by registered growers during the 1934-35 cereal year, as 29,000,000 cwt. (approximately 6,444,000 qr. of 504 lb.). In the second Order (The Wheat (Quota Payments) No. 1 Order, 1934) it is stated that the Minister estimates that the average price obtainable by registered growers throughout the United Kingdom for home-grown millable wheat sold and to be sold by them in the 1934-35 cereal year, will be 5s. 0d. per cwt. (equivalent to 2s. 6d. per qr.) at farm, and that the price deficit per cwt. of such wheat will be 5s. 0d. This Order also prescribes 84,375,000 cwt. as the Minister's estimate of the supply of flour for the period August 1, 1934, to July 31, 1935, and provides that the quota payment that every miller and every importer of flour shall be liable to make to the Wheat Commission in respect of each hundredweight of his deliveries of flour during the period commencing on

MARKETING NOTES

August 12, 1934, shall be 19-2 pence (equivalent to 4s. *od.* per sack of 280 lb.).

The new Quota Payments Order came into operation on August 12, 1934.

National Mark Eggs.—The total output of the National Mark Egg Packing Stations for the three months, April to June, 1934, was 154·6 million eggs, of which 126 million were packed under the National Mark, as compared with 144·9 million and 111·2 million, respectively, for the corresponding period of 1933. The following table shows the aggregate monthly output of the Stations during these periods:—

Month	1933			1934		
	Total Output of Packing Stations (Fresh Eggs)	Output under National Mark	Percentage of Total Output under National Mark	Total Output of Packing Stations (Fresh Eggs)	Output under National Mark	Percentage of Total Output under National Mark
	Millions	Millions	Per cent.	Millions	Millions	Per cent.
April - -	52·3	39·7	76	53·2	42·1	79
May - -	50·6	38·9	77	56·5	46·7	83
June - -	42·0	32·6	78	44·9	37·2	83
Totals for 3 Months	144·9	111·2	77	154·6	126·0	81·5

With the object of improving the quality of eggs distributed under the National Mark, the National Mark Committee has approved an amendment to the Conditions of Authorization in the National Mark Egg Scheme, whereby from June to October (inclusive) Officers of the Ministry are authorized to remove National Mark labels from containers of eggs on the premises of authorized packers or of their market agents, when the code marks on the labels indicate that 10 days or more have elapsed since the eggs were packed.

Proposed National Mark Scheme for Hothouse Grapes.—A meeting was held on April 10 last to consider draft proposals for a standard grading and packing scheme for British hothouse grapes.

MARKETING NOTES

Growers representing about 90 per cent. of the total British output of high quality hothouse grapes were present, as were also certain members of the National Mark Fruit Trade Committee, among them being representatives of London and provincial salesmen.

Following this discussion and the demonstrations given during the summer at various agricultural shows, the scheme has been revised and sent to the National Mark Fruit Trade Committee for consideration.

National Mark Fresh Fruit.—The crop of high quality apples is this year greater than ever, and there are indications that the quantity of apples marketed under the Mark will be greatly increased.

The success of the black currant scheme has been continued in the second season.

Home-grown Strawberries : Examination of Samples purchased in Covent Garden.—During the past three years, the Ministry has carried out investigations on a limited scale, with the object of discovering to what extent strawberry growers generally are endeavouring to grade their fruit and to improve their packs.

In 1932, nineteen reputed 2-lb. baskets, typical of the average run of fruit on offer, were purchased in Covent Garden Market, London. Forty baskets were bought in 1933 and forty-three in 1934, the latter being the produce of twelve growers. It is difficult to compare the results for 1933 (which appeared in the JOURNAL for August, 1933) with those for the previous year, as climatic conditions did not favour strawberry growing in 1933; but as the conditions obtaining in 1933 and 1934 were almost identical—hot and dry practically throughout—a reliable comparison can be made of the data available for these two years.

The results of the analyses of these samples may be summarized as follows:—

	1932.	1933.	1934.
Average price per lb.	5½d.	6d.	7½d.
Percentage of baskets "topped" . .	1.5	2.5	3
Percentage of baskets underweight . .	4.7	5	0.7
Average number per basket of berries up to National Mark Extra Selected standard	11	43	5.1
Average number per basket of berries up to National Mark Selected standard . .	27	28	36.4
Average number per basket of berries below National Mark grades	63	99	50.7

MARKETING NOTES

These figures show "topping" to be more prevalent in 1934 than in previous years. This is probably a true reflection of the conditions obtaining in the industry, as the natural tendency is to "top" or "face" the baskets during abnormal years when fruit of good quality is scarce. It is satisfactory to note, however, that "underweight" samples were practically non-existent this year, and, as a result of observation, it may be said that this also is a true reflection of the position generally. Net weights were not declared as a rule, but it was invariably found that the baskets contained the reputed net weight.

Only three of the twelve growers whose fruit was examined this year had made any attempt at grading, most of the baskets containing the crop as picked. In some instances, very poor fruit had been packed. The size of the berries showed some improvement, the number up to National Mark "Extra Selected" standard being slightly higher than that for 1933, whilst the number up to the standard of the National Mark "Selected" grade was the highest for the three years.

With regard to quality, twenty of the forty-three samples taken might be designated as either "fair" or "good"; and taking the whole run of the samples, "fair" would be a general average description. There was nothing so bad as the sample taken in 1933, which included a large proportion of malformed and unripe berries of varying size, dirty and damaged by slugs in several instances. On the other hand, the general average was reduced by the inclusion of a quantity of very inferior fruit.

There have been no noteworthy developments as regards containers, the chip basket still predominating.

As National Mark standards have been taken as the basis for comparison in these analyses, the following particulars of the prescribed weights and colour may be of interest. National Mark "Extra Selected" berries must weigh not less than $\frac{1}{2}$ oz., and not less than two-thirds of the surface of each berry must be coloured red. "Selected" grade berries must weigh not less than $\frac{1}{4}$ oz., and not less than one-half the surface must be coloured red.

The packing of the "Extra Selected" grade is not obligatory. Unless the crop is above the average and the grower has an established trade for the highest grade of strawberries, it may be preferable to pack "Extra Selected" berries with the "Selected" grade. In National

MARKETING NOTES

Mark packs it is permissible to "face" the top berries by placing them on the cheek; the berries must, however, be representative of the whole.

Marketing Demonstrations at Agricultural Shows.—The Ministry's marketing demonstrations at agricultural shows are being continued during September, when the following Shows will be visited:—Vale of Glamorgan (Cowbridge), Sept. 5; Dorchester, Sept. 6; Altrincham, Sept. 19; and Thame, Sept. 20. The Ministry will also have a stand at the Grocers' Exhibition, which is to be held at the Agricultural Hall, Islington, from September 22 to 28. The Ministry's exhibits at these shows will deal mainly with the National Mark schemes, with special reference to the recent grading schemes for fresh vegetables. An egg grading demonstration will be given at the Dorchester Show, and also a demonstration of a proposed National Mark scheme for butter. A demonstration of tomato grading will be given at Altrincham. The Milk Marketing Board will stage an exhibit in the Ministry's pavilion at the Vale of Glamorgan Show, and there will be continuous cinema displays in the pavilion at all the shows except Thame.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1934

ACREAGE UNDER CROPS AND GRASS AND NUMBERS OF LIVE STOCK
ON HOLDINGS ABOVE ONE ACRE IN EXTENT IN ENGLAND AND
WALES AS RETURNED BY OCCUPIERS ON JUNE 4, 1934.

(The figures for 1934 are subject to revision.)

Crops and Grass

Distribution	1934	1933	Increase		Decrease.	
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres</i>	<i>Per cent.</i>	<i>Acres</i>	<i>Per cent.</i>
TOTAL ACREAGE under all CROPS and GRASS ...	25,025 000	25,120,000	—	—	95 000	0·4
ROUGH GRAZINGS .	5,424 000	5,398 000	26,000	0·5	—	—
ARABLE LAND . .	9,248,000	9,250,000	—	—	2,000	—
PERMANENT GRASS :						
For Hay .	4,822,000	4,604,000	218,000	4·7	—	—
Not for Hay	10 955,000	11,266,000	—	—	311,000	2·8
TOTAL . .	15 777,000	15,870,000	—	—	93,000	0·6
Wheat ...	1,759,000	1,660,000	99,000	6·0	—	—
Barley .	861,000	751,000	110,000	14·6	—	—
Oats ..	1,401,000	1 495 000	—	—	94,000	6·3
Mixed Corn ..	96,300	104,500	—	—	8,200	7·8
Rye ...	18,400	19,800	—	—	1 400	7·1
Beans, harvested as corn... ..	134,500	139,100	—	—	4,600	3·3
Beans, picked or cut green ..	16,700	14,300	2 400	16·8	—	—
Peas, harvested as corn.. ..	68,700	72,600	—	—	3 900	5·4
Peas, picked or cut green ..	74,300	63,700	10,600	16·6	—	—
Potatoes.. ..	487,500	518,900	—	—	31,400	6·1
Turnips & Swedes	520,200	555 200	—	—	35,000	6·3
Mangold ...	246,200	238,100	8 100	3·4	—	—
Sugar-Beet ...	396,500	364,100	32,400	8·9	—	—
Cabbage for fodder, Kohl-rabi and Rape ...	136,900	117,600	19 300	16·4	—	—
Vetches or Tares	52,500	53,300	—	—	800	1·5
Lucerne ...	34,200	34,800	—	—	600	1·7
Mustard for seed	17 100	16,500	600	3·6	—	—
Cabbage for human consumption ...	37,000	33,100	3,900	11·8	—	—
Brussels Sprouts	34,100	35,900	—	—	1,800	5·0

* Mountain, Heath, Moor, Down and other rough land used for grazing

AGRICULTURAL RETURNS, 1934

CROPS AND GRASS—continued.

Distribution	1934	1933	Increase		Decrease	
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Per cent.</i>	<i>Acres</i>	<i>Per cent.</i>
Cauliflower or Broccoli	20,100	20,700	—	—	600	2·9
Carrots	16,500	12,900	3,600	27·9	—	—
Onions	2,100	1,900	200	10·5	—	—
Celery	7,500	7,300	200	2·7	—	—
Rhubarb	8,100	8,200	—	—	100	1·2
Linseed	1,000	1,100	—	—	100	9·1
Hops	17,800	16,900	900	5·3	—	—
Small Fruit	61,100	60,000	1,100	1·8	—	—
Orchards	254,700	249,600	5,100	2·0	—	—
CLOVER & ROTATION GRASSES						
For Hay	1,289,000	1,261,000	28,000	2·2	—	—
Not for Hay	783,000	813,000	—	—	30,000	3·7
TOTAL	2,072,000	2,074,000	—	—	2,000	0·1
BARE FALLOW	340,000	458,000	—	—	118,000	25·8

The returns made as on June 4, 1934, by occupiers of agricultural holdings exceeding one acre in extent in England and Wales relate to 30,449,000 acres of agricultural land as compared with 30,518,000 acres in 1933, a net reduction amounting to 69,000 acres or 0·2 per cent. The area returned as under crops and grass was 25,025,000 acres, a decrease of 95,000 acres or 0·4 per cent. At 5,424,000 acres, the area of rough grazings in the country showed an increase of 26,000 acres or 0·5 per cent. The total arable area of 9,248,000 acres was only 2,000 acres less than in 1933 and of this area only 340,000 acres were returned as under bare fallow compared with 458,000 acres last year. The area actually under crops (excluding land under clover and rotation grasses) was 6,836,000 acres, an increase of 118,000 acres or 1·8 per cent. over 1933. There was a decrease of 93,000 acres or 0·6 per cent. in the area under permanent grass, which was returned at 15,777,000 acres. This is the first reduction since 1916.

The total corn area which showed an increase last year was marked by a further increase of 110,000 acres due to substantial increases in the wheat and barley acreages, which were not counterbalanced by reductions in the areas under oats and mixed corn. The potato acreage showed a moderate decrease and there was also a net reduction in the area under roots, an increase in the area under mangolds being more than offset by the decrease in the area under turnips and swedes. The sugar-beet acreage showed a substantial further increase. The total acreage under vegetables was larger than in 1933, whilst the acreages under fruit and hops were also marked by increases.

Cereals.—The area under wheat showed a further increase of 99,000 acres (6·0 per cent.), the total area in England and Wales being returned as 1,759,000 acres. It is noteworthy that while the Eastern and North-Eastern divisions, which include the principal wheat-growing areas, both show a small decrease due to the smaller acreages

AGRICULTURAL RETURNS, 1934

returned in Cambridge, Essex, Norfolk and Suffolk, there has been a general increase in the area under wheat throughout the remainder of the country.

The barley acreage which has shown a reduction annually since 1931 was greater by 110,000 acres (14.6 per cent.) than in 1933 but at 861,000 acres is still below the figure returned in 1932. The increase occurred mainly in the Eastern and North-Eastern divisions, where the area under the crop was greater by 93,000 acres than last year. In the North-Western division and Wales there were net reductions in acreage.

The area under oats continued to decline and at 1,401,000 acres was 94,000 acres (6.3 per cent.) smaller than in 1933, the previous lowest figure on record. With the exception of an increase of 2,000 acres (5 per cent.) in Cornwall and a few minor increases in other counties the decrease was general throughout England. In Wales there was an increase of 2.7 per cent.

Mixed corn was grown on 96,300 acres or 8,200 acres (7.8 per cent.) fewer than last year, while the area under rye at 18,400 acres was 1,400 acres (7.1 per cent.) smaller than in 1933.

Beans and Peas—The total area returned as under beans amounted to 151,200 acres or 2,200 acres fewer than last year. The reduction is due to a contraction of 4,600 acres (3.3 per cent.) in the area to be harvested as corn, beans picked green being grown on an area larger by 2,400 acres (16.8 per cent.) than in 1933.

Peas were grown on 143,000 acres or 6,700 acres more than last year. The increase was due to an expansion of 10,600 acres (16.6 per cent.) in the area picked green, the area to be harvested as corn showing a reduction of 3,900 acres (5.4 per cent.).

In the case of both beans and peas the decrease in the area to be harvested as corn was almost entirely due to reductions in the Eastern counties, while the increase in the area to be picked green or cut for fodder was general to the whole country, only a few counties returning smaller acreages than in 1933.

Potatoes—The area returned as under potatoes was 487,500 acres, a decrease of 31,400 acres (6.1 per cent.) compared with last year. This figure, which includes every area of $\frac{1}{4}$ acre and upwards returned as under potatoes, is necessarily higher than that recently published by the Potato Marketing Board, which related only to the acreages registered by growers of 1 acre or more of potatoes.

With the exception of the Isle of Ely, where there was a small increase, the decrease in area was general but was less marked in the Eastern counties than over the rest of the country.

Sugar-beet.—At 396,500 acres the area under sugar-beet reached a new high level, being 32,400 acres (8.9 per cent.) greater than last year and 49,000 acres greater than the area under the crop in 1930, the highest point reached prior to the reduction in acreage that occurred in 1931. The majority of the counties contributed to the increase, the notable exceptions being Norfolk and East Suffolk, where smaller acreages were returned. In these two counties, however, there were large increases in acreage last year.

Fodder Roots.—A further reduction was evident in the area under turnips and swedes, the total of 520,200 acres being 35,000 acres (6.1 per cent.) less than in 1933. The decline in acreage was general, the largest decreases being those of 4,000 acres in Norfolk and of over

AGRICULTURAL RETURNS, 1934

At 16,517,700, the total number of sheep in the country was smaller by 1,572,200 (8·7 per cent.) than in 1933. The number of ewes kept for breeding fell by 465,200 (6·0 per cent) to 7,302,700. The decrease was general, except that Cumberland and Brecon returned larger numbers than last year. "Other sheep" under one year old totalled 7,483,400, a decrease of 414,600 (5·2 per cent.) on the year. In England the decline was general, Cumberland and Westmorland being the only counties to return increases worthy of mention. In Wales there was a net increase of 2 per cent. The numbers of "other sheep" one year old and above show a consistent fall throughout the country and at 1,731,600 are 692,400 (28·6 per cent) fewer than last year.

PIGS.

	1934	1933	Increase		Decrease	
	<i>No</i>	<i>No</i>	<i>No</i>	<i>Per cent.</i>	<i>No</i>	<i>Per cent.</i>
Sows kept for breeding	449,900	405,600	44,300	10·9	—	—
Other Pigs						
Over two months	1,902,100	1,844,100	58,000	3·1	—	—
Under two months	966,900	819,400	147,500	18·0	—	—
TOTAL OF PIGS	3,318,900	3,069,100	249,800	8·1	—	—

The total number of pigs in the country was returned as 3,318,900 or 249,800 more than in 1933, an increase equivalent to 8·1 per cent. There was an increase in each class. Sows kept for breeding increased by 44,300 (10·9 per cent.) to 449,900, "other pigs" over two months old by 58,000 (3·1 per cent) to 1,902,100 and "other pigs" under two months old by 147,500 (18·0 per cent.) to 966,900.

The increase in the numbers of sows and "other pigs" under two months old was general throughout the country, but in the case of "other pigs" over two months old there was a decrease in numbers in the Eastern, North-Eastern and South-Eastern divisions and in Wales, the remainder of the country generally showing larger numbers.

HORSES.

	1934	1933	Increase		Decrease	
	<i>No</i>	<i>No</i>	<i>No</i>	<i>Per cent</i>	<i>No</i>	<i>Per cent</i>
Horses used for Agricultural purposes (including Mares for breeding)	596,200	645,600	—	—	49,400	7·7
Unbroken Horses (including Stallions)						
One year and above	88,700	84,600	4,100	4·8	—	—
Under one year	43,800	41,200	2,600	6·3	—	—
Other Horses	156,800	131,200	25,600	19·5	—	—
TOTAL OF HORSES	885,500	902,600	—	—	17,100	1·9

AGRICULTURAL RETURNS, 1934

At 885,500, the total number of horses continued to show a decline, but whereas the number of horses used for agricultural purposes (including mares) and "other horses" shows a net reduction, the numbers of unbroken horses and foals are larger. The increase of 2,600 (6.3 per cent.) in the number of foals is greater than the increase of 2,100 (5 per cent.) returned last year and is due to an increase in the numbers of foals from heavy horses, those from the lighter breeds being about the same as last year. It is possible that the decrease of 49,400 (7.7 per cent.) in the numbers of horses used for agricultural purposes (including mares) and the increase of 25,600 (19.5 per cent.) in the numbers of "other horses" are exaggerated and may to some extent be due to a number of horses previously returned as used for agricultural purposes being returned this year as "other horses."

Agricultural Workers

	1934	1933	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Regular Male Workers :						
21 years old and over ...	415,300	422,500	—	—	7,200	1.7
Under 21 years old ...	107,100	113,600	—	—	6,500	5.7
TOTAL ...	522,400	536,100	—	—	13,700	2.6
Casual Male Workers :						
21 years old and over ...	72,400	78,500	—	—	6,100	7.8
Under 21 years old ...	9,200	10,900	—	—	1,700	15.6
TOTAL ...	81,600	89,400	—	—	7,800	8.7
TOTAL MALE WORKERS REGULAR & CASUAL	604,000	625,500	—	—	21,500	3.4
Women and Girls :						
Regular workers	53,200	59,600	—	—	6,400	10.7
Casual workers	30,500	30,400	100	0.3	—	—
TOTAL ...	83,700	90,000	—	—	6,300	7.0
TOTAL WORKERS, ALL CLASSES ...	687,700	715,500	—	—	27,800	3.9

With the exception of female casual workers, all classes of agricultural workers showed a decrease, the increases noted last year not being maintained. The fall in the numbers of male workers was more marked amongst casual workers than amongst regular workers, and in both cases heavier amongst those under 21 years old than amongst the older men. The number of regular male workers 21 years old and over shows a decrease of 7,200 (1.7 per cent.), the only division

AGRICULTURAL RETURNS, 1934

to show an increase being the North-Eastern; the numbers of regular male workers under 21 years old fell by 6,500 (5·7 per cent.). In the case of casual male workers the decreases are 6,100 (7·8 per cent.) and 1,700 (15·6 per cent.) respectively. The numbers of women and girls returned as casual workers show little change, but there is a reduction of 6,400 (10·7 per cent.) in the numbers of those returned as regularly employed on agricultural work.

Acreage of Hops

PRELIMINARY STATEMENT COMPILED FROM THE RETURNS COLLECTED ON
THE 4TH JUNE, 1934, SHOWING THE ACREAGE UNDER HOPS IN
EACH COUNTY OF ENGLAND IN WHICH HOPS WERE GROWN,
WITH A COMPARATIVE STATEMENT FOR THE YEARS
1933 AND 1932.

Counties, etc.				1934	1933	1932
				Acres	Acres	Acres
Kent	East	...	...	2,070	2,001	1,921
	Mid	...	...	2,830	2,629	2,549
	Weald	...	...	5,050	4,736	4,507
	Total Kent...	...	...	9,950	9,366	8,977
Hants	...	...	...	580	536	520
Hereford	...	...	...	3,890	3,805	3,864
Surrey	...	...	...	90	89	83
Sussex	...	...	...	1,380	1,200	1,195
Worcester	...	...	...	1,850	1,838	1,828
Other counties	...	...	...	60	61	64
Total				17,800	16,895*	16,531*

* These figures include the acreage left unpicked, which was estimated in 1933 to be about 20 acres and in 1932 about 200 acres.

SEPTEMBER ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington.

THE influence of the weather on farming prospects has been abundantly illustrated this year. After a period of drought that in turn has reduced the output of grass land and hastened the maturity of cereals, the occurrence of rain from the first week of August onwards has quickly changed the appearance of the countryside. There have been exceptions. The four northern counties in particular have experienced a good year, with grass and hay crops well up to the average and in many cases above normal. For the rest of the country the drought has broken earlier this year than in 1933, and in consequence it is possible to look forward to the autumn and winter problems with much more confidence than seemed possible at one time.

The actual amount of rain that has fallen up to the time of writing is not considerable, but it has been sufficient in most instances to renew grass growth and impart vigour to the foliage of roots and other green crops. With last year's experiences still fresh in the memory it is reasonably safe to assume that good root crops should materialize where satisfactory "takes" have been secured. Too often the main trouble has been the widespread havoc caused by turnip fly attacks despite persistent sowings. Here and there splendid takes of swedes and kales have been secured, but even on the same farm there have been variations in the severity of attack according to the variety of crop. Thus on Mr. J. C. Robinson's farms at Iford seedings of rape were not affected to the same degree as marrow-stem kale.

The chief concern with many is the possibility of securing a considerable growth of grass before the end of September. This would appear to be dependent principally upon a continuation of reasonable rainfall. There are other factors, however, of which warmth, sunlight and fertility are important. In a normal year September is quite favourable to the continuation of grass growth, a remark which often applies to October also. In the Eastern Midlands September rainfall is slightly higher on the average than that of April and May, while bright sunshine is also slightly

SEPTEMBER ON THE FARM

higher. Ground frosts that play havoc with young growth are also rare in September. Reference was made last month to the desirability of applying nitrogen to pastures at this late stage in the season. July and August applications of nitrogenous fertilizers have been particularly successful in the present season, but it is still possible for September applications to influence the quality and quantity of sheep keep on pastures throughout the winter.

It is necessary to recognize the desirability of allowing pastures an opportunity for rest from stock even at this period of the year. When grass is bared down as it has been this year, there is a strong tendency for live stock to keep the new growth in check unless the fields are rested. Where pastures are utilized for winter grazing it is usually sound policy to allow some of this late growth to mature, and to make an earlier start on the feeding of supplementary forage crops. In 1933 the writer commenced feeding marrow-stem kale from the third week of August when the plant was about half grown. It was interesting to note that the roots started growth again, and produced some acceptable sheep feed by the following December and January.

Arable Operations.—With the prospect of corn harvest being well out of the way before the beginning of September, the main arable duties consist in preparing for autumn seedings and the preparation for next year's seed beds. An early harvest is always an asset in this matter, for it enables full time to be given to preliminary cleaning operations that in a bad or late year are often neglected. One danger of an early harvest is that one is inclined to take things easy and not to make the same progress that is otherwise possible. This, however, must be guarded against. Frequent reference has been made to the importance of stubble cultivation. The more general use of tractors has meant a considerable increase in stubble cleaning—which should never be neglected wherever it can be practised. The value of early cultivations is not entirely concerned with weed control. It has been obvious from this year's cropping experiences that stubbles subjected to paring and skimming hold the rain more satisfactorily—a matter of no small importance in a dry season.

The immediate concern is the preparation of seed beds for wheat. Wheat traditionally prefers a stale furrow, and

several practical considerations support it. Thus an early preparation of the seed bed for wheat secures a preliminary germination of weed seeds that might otherwise be troublesome, while such land is likely to hold rain better and therefore possess a higher moisture content to ensure more rapid germination after seeding. Further, early preparation means that the land has time to settle and is not so light and hollow when seeded as ground freshly ploughed and worked. There is little doubt that ground intended for root breaks next year is equally benefited by early cultivations even in advance of the normal deep winter ploughing.

It is a point of more than ordinary interest that within the last hundred and fifty years there has been little development in practical knowledge concerning the cultivation of soils. It has long been recognized that a good seed-bed is the surest foundation for a good crop. Manuring can in no sense take the place of proper cultivations, though there is much evidence that this is often expected. Ploughing is the basis of seed-bed formation but views differ as to what is the proper depth at which to plough. The real answer can only be determined by experience, though there are many contradictory factors.

There is a general feeling among agriculturists that deep ploughing realizes the ideal conditions for maximum crop production. In this respect there is some support from horticultural practice, while the records of good farming practice invariably support it. Thus Sir John Sinclair in his "Code of Agriculture" (1817) refers to the fact that "Mr. Marshall has known a succession of shallow ploughing farmers beggared on a stiff-land farm, and their successors by deeper tillage make a farmer's fortune upon it." The actual experimental evidence in support of this contention is not particularly convincing. With wheat, the time of ploughing is considered to be more important than the depth, since deep ploughing may add to the difficulties of forming a reasonably consolidated seed bed. There is, however, more general agreement that the cultivations for fallow crops should explore the full range of the true soil. A ploughing depth of five to six inches is an ideal one for wheat, whereas for fallow crop work, an attempt should be made to penetrate to at least eight inches.

Change of Seed in Wheat.—One effect of the Wheat

SEPTEMBER ON THE FARM

Act has been to encourage farmers to make more frequent changes of wheat seed than formerly. This is no doubt because the deficiency payment is not available for home-grown wheat that is used for seed purposes on the farm on which it was grown. Many have assumed that the change of seed that is now general is calculated to improve the cropping capacity of wheat crops. There is little or no evidence to support this assumption. Comparisons that have been made indicate that there is no evidence of deterioration in cropping capacity as a result of using home-grown seed. Some farmers actually claim that under the conditions now prevailing in regard to seed wheat there is a greater risk of introducing weed seeds, but this need not be so if properly dressed samples are purchased. Changes of seed are invariably made necessary on the average farm by reason of the inability to keep the crops true to type through the mix-up that generally takes place on storing different varieties and on threshing them. In a bad harvest it is also considered desirable to choose new seed from an earlier district. In such circumstances new seed invariably shows itself to the best advantage, though another outstanding fact should not be overlooked—that a well-dressed sample will invariably show up better than an ordinary farmer's sample that is sown straight from the threshing drum without further cleaning and selection.

Piggery Construction and Alterations.—The number of inquiries concerning suitable buildings and equipment indicate that more farmers are becoming impressed by the possibilities of pig breeding and feeding. There are, however, various pitfalls into which the unwary may stray unless care is exercised, and this particularly applies to the conversion of existing buildings to serve the needs of pigs. In several instances that have come under the writer's observation barns have been utilized for this purpose. The ideal pig house is rarely secured by simply dividing up the existing floor space with pens and feeding passages and the installation of troughs. This fact has emerged from experiences gained during the past six years on the Midland College farm with a pig house formed out of an old cowshed. This was a somewhat lofty building, reasonably well lighted, provided with a floor of concrete laid direct on the earth, and with a central feeding and cleaning-out passage with the pens running to the walls on each side. Serious

troubles were experienced in this house from the beginning, but by a series of improvements reasonable success has been achieved. The principal factors in a successful pig house appear to be (1) adequate ventilation, and (2) warm, dry flooring.

In ordinary practice the ventilation is a quite secondary matter, but in the writer's experience it should take precedence over other factors, and should receive special attention in converted buildings. In so many instances the inlet ventilation is too high up in the wall, with the result that there is no adequate circulation of air in the bottom of the pens. This is specially true in buildings that possess no suitable air exits. The simplest and probably the most effective form of ventilation is a louvre ventilator in the ridge of the roof and inlet ventilators by means of wall openings in the side walls at a height of 2 to 3 ft. from the ground. An ordinary glazed drain pipe inserted in a slanting position through the wall is quite effective, but an interesting alternative was seen by the writer in a cowshed in Sussex last month. This consisted of an aperture in the the wall with dimensions of about 8 in. by 4 in. on the outside wall and 14 by 8 in. on the inside wall. The advantage of this form of wall aperture is that direct draughts are avoided.

The subject of suitable flooring is a study by itself. The mistakes that are most commonly made arise from the use of concrete without the provision of an insulating layer of broken brick between the earth and the concrete. It is also desirable for the floor level to be above the level of the ground outside. Equally important is the provision of adequate slope for the rapid drainage of the pens. It is sometimes suggested that the sleeping quarters of the pens should consist of wooden platforms. There is no real need for these if the other details of floor construction have been properly arranged. Wood is not a suitable form of flooring in a permanent pen, for the reason that it tends to get foul. Existing flooring that is unsatisfactory by reason of coldness can be vastly improved by the building in of platforms composed of red or blue brick set on edge. For flooring in new buildings much support is now given to those types that utilize air spaces between the soil and the top layer of concrete. These may take the form of hollow bricks, drain pipes or even air spaces left in concrete. There is evidence to prove the increased warmth of such floorings in winter.

SEPTEMBER ON THE FARM

Temperature control in summer and winter is to some extent dependent upon a combination of good insulation and ventilation. As far as winter conditions are concerned lofty roofs are not particularly helpful. Some attempt to introduce a lower roof is usually worth while in converted buildings, though in ordinary practice this frequently takes the form of battens of straw placed some three or four feet above the sleeping quarters of the pigs. The success of these low artificial roofs is sometimes minimized by the lack of proper ventilation that frequently results. In fact, in the writer's experience, ordinary sacking stretched across laths has been more effective. This material allows for better ventilation, saves the pigs from draughts, and does not harbour rats as straw does. A permanent low roof can be economically installed by means of a fibre sheeting—as has been done at the Midland College farm.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended August 8				
	Bristol	Hull	L'pool	London	Cost per unit at London
Nitrate of soda (N. 15½%) ..	£ 7 12d	£ 7 12d	£ 7 12d	£ 7 12d	s. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 0
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20-6%) ..	6 14d	6 14d	6 14d	6 14d	6 6
Calcium cyanamide (N. 20-6%)	6 15s	6 15s	6 15s	6 15s	6 7
Kainit (Pot. 14%) ..	..	..	2 12	2 14g	3 10
Potash salts (Pot. 30%) ..	..	..	4 4	4 2g	2 0
" (Pot. 20%) ..	..	..	3 3	3 6g	3 4
Muriate of potash (Pot. 50%) ..	..	..	6 12	6 9g	2 7
Sulphate " (Pot. 48%) ..	..	..	7 12	7 11g	3 2
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26-27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16b	3 6
" (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12b	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	7 15	6 17	6 15f	6 7	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 5	5 12	5 15f	5 10	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 12s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 20 cwt. and under 1 ton 15s. extra, and for lots of less than 20 cwt. but not less than 2 cwt., 80s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails; southern rails, 12s. 3d. extra.

NOTES ON FEEDING

W. B. MERCER, M.C., B.Sc. (Principal), and Colleagues,
Cheshire School of Agriculture, Reaseheath, Cheshire.

MANY foodstuffs have recently risen in price, but the general level of prices is still low enough to awaken sombre reflections on the relative costs of purchased and home-produced fodders, and the cognate problem of what to do with the land of England. There are three separate and distinct problems in food valuations; or rather the one problem has three aspects—(1) that of relative values in purchased concentrates, (2) that of economic disposal of foods already produced, and (3) that of designing food production on the farm in the light of relative costs and prices. The three present three degrees of complexity—positive, comparative and superlative.

(1) Valuation of Purchased Foods.—The scriptures written for our learning by chemists provide a comparatively safe and easy guide in the purchase of concentrates. Foods in great variety are on the market; their productive capacities have been measured experimentally, and expressed numerically in the familiar starch-equivalent figures; and they are easily interchangeable, so that purchases can be based on costs per unit of starch equivalent.

True, they are not so readily interchangeable as was at one time thought. Scientific rationing to-day involves much more than starch equivalent or starch equivalent and protein equivalent. The stone, nay, the pebble, that the builders of rationing theory rejected is proving in some cases the headstone of the corner. Vitamins and mineral substances have been shown to play a part in nutrition so important as upon occasion to become vital. Over vast areas in New Zealand bush sickness has been traced to deficiency of iron in the diet, and limonite licks have proved the deciding factor in stock farming. Remarkable increases in butterfat production among milking cows have resulted from the use of this mineral. Even more striking have been the results with ewes. At one station a small flock of limonite-fed ewes reared 100 per cent. of lambs, while in a comparable lot receiving none of this mineral, mortality amongst the ewes was 90 per cent. and even higher amongst

NOTES ON FEEDING

the progeny. In New South Wales dressings of rock phosphate and sulphur have increased the productivity and stock-carrying capacity of pastures even more than superphosphate and nitrogen. At Munich an addition of iodine to the rations of milking cows has resulted in increases both of milk and butter-fat content.

All the evidence available to date suggests that mineral deficiency in this country is likely to be rare, though slight calcium and phosphorus deficiencies may occur more frequently than we are aware. A number of instances of fat deficiency reported to one of us this season have occurred under conditions strongly suggestive of mineral shortage. Slight mineral deficiencies, however, are extremely difficult to detect, owing to the long interval between cause and apparent effect.

A further complication in rationing lies in the nature of the proteins. Not all protein is the same protein. Many nitrogenous compounds are lumped together under this name; and slowly the biochemists are disentangling the roles of the several compounds involved. The amino-acids cystine, lysine, tryptophane and histidine appear to be essential to ruminants. Cystine has been shown to be of prime significance in wool production and lysine in milk production. It would, indeed, appear that the efficiency of concentrated foods for milk production can be measured in terms of lysine content; pea meal and bean meal, rich in this compound, are biologically more efficient than earth-nut cake and linseed cake.

While, however, it is now clear that scientific rationing involves much more than simple sums in arithmetic with two variables, the range of foods available is still sufficient to allow of purchase on the simple basis of costs per unit of starch equivalent.

(2) Disposal of Home-produced Foods.—Sooner or later, every stock farmer finds himself wondering whether to sell certain of his home-grown foods, or to consume them on the farm. Usually the question arises over barley, oats or potatoes (until the Wheat Subsidy was available it often arose also over wheat). The case of barley is most easily settled by reference to the price of the substitute that most nearly resembles it in composition—maize. Oats are more difficult, as no one food can replace this grain satisfactorily. To arrive at a general principle by which all questions of

NOTES ON FEEDING

this kind can be decided it is necessary to place a cash value on home-grown foods, based on the cash values of purchased foods. This is not a simple matter, and no method with which the writers are familiar is entirely satisfactory. The Departmental Committee on Rationing of Dairy Cows, which reported in 1925, selected four standard foods and calculated cash values for Protein Equivalent and Starch Equivalent by the use of simultaneous equations of which the following (for barley meal) may serve as a type.

$$6x + 71y = L$$

where x = Protein equivalent, y = Starch equivalent and L denotes the price per ton on the farm. Mathematically, however, this equation is unsound—as indeed the Committee allow—for the starch equivalent includes the starch value of the protein. In our view it would be more accurate to deduct the starch value of the protein (which amount has been shown experimentally to be 0.94 times the protein equivalent) from the starch equivalent, the equation then reading—

$$6x + (71 - 0.94 \times 6) y^1 = L$$

or $6x + 66y^1 = L$

where x = Protein equivalent, and y^1 the Starch equivalent of the non-proteinous compounds of the food.

The problem of selecting the standard foods upon which the standard values of x and y^1 are to be based of course still remains. If the foods selected are dear, the standard values will be high; if cheap foods are chosen the values will be low. Taking, however, the four used by the Committee (two of these are dear at present while two are cheap) we find that the standard cost of protein equivalent in early August worked out at 1.8 shillings per unit. Non-proteinous starch equivalent also worked out at 1.8 shillings per unit.

Adopting these values it may be concluded that barley in early August had a feeding value of £6 10s. per ton, and oats £5 8s. per ton, while potatoes were worth £1 12s. per ton to feed. At that time, therefore, there was little temptation to the producer to feed any of the products to his own stock, as better prices could be obtained on the market.

(3) Crop Production.—Since crops are grown for stock-feeding and purchased foodstuffs are at all times available as a substitute (or partial substitute) for home-produced fodder, crop production must in the long run be governed

NOTES ON FEEDING

by the prices of purchasable substitutes. It is neither desirable nor practicable to attempt precise evaluations, as apart from the fact that systems of cropping are designed eighteen months ahead, alterations in cropping involve a whole host of managerial problems—often the cropping of the farm is the central problem of management. Certain crops on a stock farm, however, must be regarded as potential sources of starch equivalent, and their actual yield and cost per unit should be checked periodically against the cost at which substitutes could have been purchased.

We have ourselves found the cost per cwt. of starch equivalent supplied in various crops a helpful figure. In the three years 1932, 1933 and 1934 to date, costs per cwt. of starch equivalent in twelve representative concentrated foods have averaged 8.94s., 7.79s. and 7.23s. per cwt. respectively. What are the comparable rates for foodstuffs produced on the farm? The answer will of course vary on every farm, and it would take us far beyond the scope of the present article to discuss the question in any detail. It is immensely difficult to put the relative costs on a fair footing. Meantime we may observe that kale appears, from our own records, to be a much cheaper source of food material than mangolds, that seeds hay is almost invariably cheaper than meadow hay, and that the food supplied in pasture grass is produced at a rate far lower than in any other crop. In a dry year, however, even this crop is but little cheaper than, say, sugar-beet pulp.

3½ lb. to the Gallon.—We conclude with a tale, for the accuracy of which we can vouch. There had been a sudden rise in milk yield. Nearly every cow showed a rise of 2 lb. per day, and Daisy had jumped from 53 to 67 lb. It happened while the cowman was away, and Jack was doing the rationing. Of course the herd was rationed on strictly scientific lines; but sometimes practice is ahead of science; Jack came of a long line of cowmen, and . . . well, you never know. Then there had been the lecture. A certain speaker had been down to deliver a discourse on rationing. He had described the rationing of his Friesians. His system seemed very similar to the system adopted for years past in the herd; but certainly he had insisted very strongly on . . . after all it was just possible . . . At all events the matter must be looked into; so Jack was tackled. Jack was very vague and evasive; but it was clear the cows had had far more than the ration they were supposed to get.

NOTES ON FEEDING

"But surely, you know better than that. Didn't you hear Mr. — say 3½ lb. to the gallon?" "Oh, ay," said Jack. "I 'eerd 'im say 3½ lb. to the gallon; but 'e didn't say 'ow many times a day 'e give it 'em."

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	6 4
Maize	78	7.6	5 1
Decorticated ground-nut cake	73	41.3	6 3
„ cotton cake ..	68	34.7	6 15

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.58 shillings, and per unit protein equivalent, 0.73 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1933, issue of the Ministry's JOURNAL, p. 784.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 1
Oats	60	7.6	5 0
Barley	71	6.2	5 17
Potatoes	18	0.8	1 9
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 11
Beans	66	19.7	5 19
Good meadow hay	37	4.6	3 2
Good oat straw	20	0.9	1 12
Good clover hay	38	7.0	3 5
Vetch and oat silage	13	1.6	1 2
Barley straw	23	0.7	1 17
Wheat straw	13	0.1	1 1
Bean straw	23	1.7	1 18

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu-rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro-tein equiv.
Wheat, British	£ 5 12	£ 0 8	£ 5 4	72	1 5	0.76	9.6
Barley, Argentine	6 7	0 8	5 19	71	1 8	0.89	6.2
" Persian	6 2*	0 8	5 14	71	1 7	0.85	6.2
Oats, English white	6 17	0 9	6 8	60	2 2	1.16	7.6
" " black and grey	7 0	0 9	6 11	60	2 2	1.16	7.6
" Scotch White	7 5	0 9	6 16	60	2 3	1.21	7.6
" Canadian No. 2 Western	7 5	0 9	6 16	60	2 3	1.21	7.6
" " mixed feed	5 15	0 9	5 6	60	1 9	0.94	7.6
" Argentine	7 7	0 9	6 18	60	2 4	1.25	7.6
" Chilian	7 5	0 9	6 16	60	2 3	1.21	7.6
Maise, Argentine	5 7	0 7	5 0	78	1 3	0.67	7.6
" Gal. Fox	4 18†	0 7	4 11	78	1 2	0.62	7.6
" Russian	4 18†	0 7	4 11	78	1 2	0.62	7.6
Peas, Indian	8 10†	0 14	7 16	69	2 3	1.21	18.1
" Japanese	20 2†	0 14	19 8	69	5 7	2.99	18.1
Darl, Egyptian	6 0†	0 8	5 12	74	1 6	0.80	7.2
Milling offals—Bran, British	5 2	0 15	4 7	43	2 0	1.07	9.9
" " broad	5 15	0 15	5 0	43	2 4	1.25	10
Middlings, fine imported	5 7	0 12	4 15	69	1 5	0.76	12.1
Weatings†	5 10	0 13	4 17	56	1 9	0.94	10.7
" Superfine†	6 10	0 12	5 18	69	1 9	0.94	12.1
Pollards, imported	5 0	0 14	4 6	62	1 5	0.76	11
Meal, barley	7 17	0 8	7 9	71	2 1	1.12	6.2
" " grade II	7 2	0 8	6 14	71	1 11	1.03	6.2
" maize	6 0	0 7	5 13	78	1 5	0.76	7.6
" " germ	6 0	0 11	5 9	79	1 5	0.76	8.5
" locust bean	7 0	0 5	6 15	71	1 11	1.03	3.6
" bean	7 15	0 16	6 19	66	2 1	1.12	19.7
" fish	16 0	2 1	13 19	59	4 9	2.54	53
Maise, cooked flaked	6 7	0 7	6 0	84	1 5	0.76	9.2
" " gluten feed	5 12	0 12	5 0	76	1 4	0.71	19.2
Linseed cake, English, 12% oil	9 10	1 0	8 10	74	2 4	1.25	24.6
" " " 9% "	9 2	1 0	8 2	74	2 2	1.16	24.6
" " " 8% "	8 17	1 0	7 17	74	2 1	1.12	24.6
" " " 6% "	9 2½	1 0	8 2	74	2 2	1.16	24.6
Soya-bean cake, 5½% oil	7 5½	1 8	5 17	69	1 8	0.89	36.9
Cottonseed cake—English, Eryp- " " tian seed, 4½% oil	4 7	0 17	3 10	42	1 8	0.89	17.3
" " " Egyptian, 4½% "	4 2	0 17	3 5	42	1 7	0.85	17.3
" " " decorticated, 7% "	6 15†	1 8	5 7	68	1 7	0.85	34.7
" " " meal, decorticated, 7% "	6 12†	1 8	5 4	68	1 6	0.80	34.7
Coconut cake, 6% oil	6 0	0 18	5 2	77	1 4	0.71	16.4
Ground-nut cake, 6-7% oil	6 0*	0 18	5 2	57	1 9	0.94	27.3
" " " decor., 6-7% oil	6 12	1 7	5 5	73	1 5	0.76	41.3
" " " imported, ...							
" " " decorticated, 6-7% oil	5 15	1 7	4 8	73	1 2	0.62	41.3
Palm-kernel cake, 4½-5½% oil	5 17†	0 12	5 5	73	1 5	0.76	16.9
" " " meal, 4½% oil	5 17†	0 12	5 5	73	1 5	0.76	16.9
" " " meal, 1-2% oil	5 7	0 12	4 15	71	1 4	0.71	16.5
Feeding treacle	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale	5 0	0 11	4 9	48	1 10	0.98	12.5
" " " porter	4 12	0 11	4 1	48	1 8	0.89	12.5
Dried sugar-beet pulp (a)	5 2	0 5	4 17	66	1 6	0.80	5.2

(a) Carriage paid in 5 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

† In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of July 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is $\frac{9}{74}$. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is $\frac{9}{74 \times 22.4}$. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 74.0d.; P₂O₅, 22.1d.; K₂O, 32.8d.

MISCELLANEOUS NOTES

United Dairies' Scholarships, 1934-35

THE United Dairies' Scholarships awarded for the year 1934-35, the colleges at which they are tenable, and the names of the successful candidates (with the schools at which they were educated) have been announced as follows:—

Tenable at Reading University:

3-YEAR DEGREE COURSE—

Margaret M. Lewis, Bartle, nr. Bridgwater (County School, Bridgwater).

3-YEAR DEGREE COURSE IN AGRICULTURE—

Kenneth N. Russell, Winford, nr. Bristol (Merrywood Secondary School, Bristol).

Tenable at Seale-Hayne Agricultural College:

3-YEAR DEGREE COURSE—

* Jack Webber, Blakes, Chumleigh (Barnstaple Grammar School).

Tenable at Somerset Farm Institute, Cannington:

1-YEAR DAIRYING COURSE:

Arthur J. Withers, Clapton on Gordano, nr. Portishead (Bristol Grammar School).

Lucy J. Westmacott, Chilfrome, Dorchester (Bridport Grammar School).

Evelyn Winifred Spry, Veryan, Truro (West Cornwall School, Penzance).

Vivienne C. Garrett, Babington, Frome (Sunny Hill School, Bruton).

* If the award is not accepted by Jack Webber, the grant for the 3-year Degree Course at Seale-Hayne Agricultural College will be applied to Alfred J. Brown, Callington (Callington County School).

These scholarships, which are awarded annually, are provided from the Fund created, in 1924, by United Dairies, Ltd., for the purpose of promoting and encouraging practical and scientific education in dairying and dairy farming. They are available for the sons and daughters of farmers and smallholders in the counties of Cornwall, Devon, Dorset and Somerset, and are tenable at various agricultural centres of education.

The Agricultural Index Number

THE July index number of the prices of agricultural produce, at 114, was 4 points above the previous month and 13 points higher than in July, 1933. Increases in the index numbers for fat cattle, milk, potatoes, and hay were the factors responsible for the rise of 4 points in the general

MISCELLANEOUS NOTES

index, these advances being offset to some extent by reductions in the indices for fat sheep and pigs, poultry, eggs and cheese.

Monthly index numbers of prices of Agricultural Produce.
(Corresponding months of 1911-13=100.)

Month.	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	108
April	146	137	123	117	105	111
May	144	134	122	115	102	112
June	140	131	123	111	100	110
July	141	134	121	106	101	114
August	152	135	121	105	105	—
September	152	142	120	104	107	—
October	142	129	113	100	107	—
November	144	129	112	101	109	—
December	143	126	117	103	110	—

Grain.—Wheat again averaged 5s. 4d. per cwt., but as a slight rise occurred in July of the base period, the index declined one point to 66. If allowance is made for the "deficiency payment" under the Wheat Act, 1932, the index would be increased to approximately 124, the effect of which would be to raise the general index for agricultural produce from 114 to 118. Barley became dearer by 3d. and oats by 1d. per cwt., the former averaging 7s. 4d. and the latter 6s. 4d. per cwt., but whereas the index for barley rose 2 points to 98, that for oats was unaltered at 83.

Live Stock.—The average quotation for second quality fat cattle again recorded little change at about 35s. per live cwt., but the index advanced 5 points to 99 owing to prices having fallen in July, 1911-13. A further reduction occurred in the average for fat sheep and at 128 the index was 10 points lower. Both baconers and porkers were cheaper on the month, the former averaging 4d. and the latter 5d. per score lb. less, and the relative indices each fell 5 points to 105 and 108. Dairy cows again realized higher prices, an average increase of 16s. per head causing the index to advance 3 points to 104. As is usual in July, store cattle sold at lower values but the decrease during the month under review was proportionately heavier than in the base period and the index was 2 points below that for June. The usual downward movement in the quotations for store sheep and pigs also was apparent; the index for the former was one point lower although that for the latter was unaltered.

MISCELLANEOUS NOTES

Dairy and Poultry Produce.—During July, the wholesale contract prices for the sales of milk were 1d. per gallon higher in the South Eastern Region and the index was 6 points above the previous month. Butter averaged $\frac{1}{2}$ d. per lb. more but the index was unchanged at 87, while eggs, although nearly 1d. per dozen dearer than in June, when the index was 100, were 3 per cent. cheaper than in 1911-13. All descriptions of poultry sold at lower rates and the combined index fell 12 points to 114.

Other Commodities.—Owing to the change from old crop to new crop, the prices of potatoes showed the usual sharp increase during July, the index being 136, compared with 82 in June. A year ago new crop realized 5 per cent. less than pre-war. The upward movement in the quotations for hay has continued and the combined index for July was 3 points higher at 91. An advance of fully $\frac{1}{2}$ d. per lb. was recorded in the average for wool, the index appreciating 4 points to 86.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1932	1933	1934			
	July	July	April	May	June	July
Wheat	79	81	57	59	67	66
Barley	94	88	103	98	96	98
Oats	101	75	84	81	83	83
Fat cattle	117	98	95	95	94	99
„ sheep	97	107	128	150	138	128
Bacon pigs	87	94	125	117	110	105
Pork „	86	93	126	120	113	108
Dairy cows	112	105	103	100	101	104
Store cattle	113	96	84	88	87	85
„ sheep	90	87	95	103	109	108
„ pigs	84	108	137	134	135	135
Eggs	114	103	99	89	100	97
Poultry	119	126	119	129	126	114
Milk	143	142	168	162	162	168
Butter	104	94	91	85	87	87
Cheese	131	125	117	123	108	90
Potatoes	134	95	89	90	82	136
Hay	66	68	80	83	88	91
Wool	58	72	96	89	82	86

Revised index numbers due to Wheat Act payments.

Wheat	—	121	132	126	126	124
General Index	—	104	117	117	114	118

MISCELLANEOUS NOTES

Midland College Poultry Conference

THE eleventh Annual Poultry Conference of the Midland Agricultural College, Sutton Bonington, Loughborough, will be held at the College on September 25, 1934, under the Chairmanship of Mr. Street-Porter, J.P. (Chairman of the National Farmers' Union Poultry Committee), who will open the proceedings at 10.45 a.m. At the morning session Major H. D. Day will read a paper on "Production and Marketing of Table Poultry," on which subject a discussion will be initiated by Mr. R. B. Shaw. Mr. H. H. Harris will follow with a paper on "Some Egg Defects as observed by the Merchant," and Mr. E. Goldsmith will deal with "Egg Quality as noted at a Packing Station."

In the afternoon, following the presentation of the College Challenge Cup to the winner of the Inter-County Laying Trials, Mr. W. Hamnett will speak on "Lack of Stamina and some possible Causes." and Mr. H. T. Atkinson will initiate the ensuing discussion. The discussion on the final paper entitled "Culling and its Importance to the Poultry-keeper" to be read by Miss H. M. Molyneux, will be opened by Mr. A. Tyler. After the Chairman's address, the Conference will conclude with an inspection of the College buildings and poultry plant.

Further particulars of the Conference, information as to accommodation, etc., can be obtained on application to the Principal, Dr. T. Milburn, at the College.

Effect of the Drought upon "Stomach-Worm Disease" or "Scouring" in Lambs

As a result of the prolonged drought of last year a bad outbreak of this disease developed in lambs during the late part of the autumn and early winter, causing heavy losses to sheep farmers in many parts of the country. Careful inquiries show that the shortness and the poor quality of the pasture are intimately connected with its occurrence, through increasing the intake of young worms from the ground and aiding their subsequent development in the sheep. Contrary to what is usually thought, the parasitic worms that cause this disease do not multiply in the stomach of the sheep but require to be picked up individually with the herbage. When the herbage becomes very short the sheep spend a greater time in grazing and gather the grass from a wider area of the field, thereby collecting more worms than they would do at normal times.

MISCELLANEOUS NOTES

Experiments have also shown that the worms develop much more satisfactorily in sheep on a deficient diet than they do in thriving sheep receiving an adequate ration; it is, in fact, a difficult matter to infect well-fed and thriving lambs of 9 to 10 months, or older, with many of the kinds of worms that are concerned in the development of the stomach-worm disease, and it is, therefore, wise to keep up their condition.

It is well known to farmers, and is clearly indicated by controlled experiment that, in the late part of the summer, the herbage is of a poor quality: dried herbage is particularly poor, and when it also becomes very short, as during a period of drought, there is a great risk of the sheep being undernourished. The call for a generous supplementary feed is thus very clear.

The weather conditions of the present summer in many ways resemble those of last year, and there is a danger of a reappearance of the disease. Farmers are, therefore, advised, wherever the pasture becomes unusually short and burnt, to give a liberal allowance of concentrated food, and not to wait until the sheep show signs of doing badly: the lambs will not then require to graze so continuously and their intake of parasitic worms from the pasture will be reduced, while a vigorous condition will also be maintained and they will be able to put up a stout resistance against the development of those worms which they do acquire.

A concise description of these worms, together with an account of their history, distribution and control, is fully set out in the Ministry's Leaflet, No. 75 (*Stomach Worms in Sheep*), single copies of which may be obtained free of charge on application to the Ministry.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at 7, Whitehall Place, London, S.W.1, on July 31, 1934, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders:—

Berkshire.—An Order cancelling as from August 12 the existing minimum and overtime rates of wages and fixing fresh rates in substitution thereof to come into force on that date and to continue in operation until December 29, 1934. The minimum rate for male workers of 21 years of age and over is 30s. (instead of 28s. 6d. as at present) per week of 50 hours except in the week in which Christmas Day falls, when the hours are 41, with overtime throughout the period unchanged at 8½d. per hour. The minimum rate for female workers of 19 years of age and over is unchanged at 5d. per hour.

MISCELLANEOUS NOTES

Cambridgeshire and Isle of Ely.—An Order fixing special minimum rates of wages for employment in the corn harvest of 1934. The rate in the case of male workers of 21 years of age and over is a sum of £11 to cover a period of four weeks of 64 hours per week (excluding Sunday) and in addition 11d. per hour for all employment on Sundays and in excess of 64 hours per week. For female workers of 18 years of age and over the rate is 8d. per hour for all time spent on the corn harvest.

Hertfordshire.—An Order fixing special overtime rates of wages for employment during the corn harvest of 1934. The overtime rate for male workers of 21 years of age and over is 11d. per hour, and for female workers of 19 years of age and over 8½d. per hour, provided that the rates paid to a worker employed on the farm throughout the period of the harvest (except in the case of a worker who, without good cause, refuses to work at least 66 hours per week if required) shall be such as to yield not less than 4s. per acre in the case of male workers of 21 years of age and over and 3s. 3d. per acre in the case of female workers of 19 years of age and over in respect of the average number of acres harvested per worker employed on the farm throughout the period of the harvest.

Monmouthshire.—An Order continuing the operation of the existing minimum and overtime rates of wages from September 16, 1934 (i.e., the day following that on which the existing rates are due to expire) until March 15, 1935. The minimum rates for male workers of 21 years of age and over are 31s. per week of 54 hours in summer or 50 hours in winter, with overtime at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Christmas Day and Boxing Day. For female workers of 17 years of age and over the minimum rate is 6d. per hour for all time worked.

Norfolk.—An Order fixing special minimum and overtime rates of wages for employment on the corn harvest in 1934. The minimum rate in the case of male workers of 21 years of age and over employed for the whole harvest period is £11 to cover all time spent on the harvest. For male workers who are not employed for the full period, special differential rates are fixed for all overtime employment on the corn harvest, the rate for male workers of 21 years of age and over being 9½d. per hour.

Suffolk.—(1) An Order cancelling as from August 26, 1934, the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into operation on that date and to continue in force until December 28, 1935. The minimum rates for male workers of 21 years of age and over are 30s. (instead of 29s. as at present) per week of 50 hours in summer, except in the week in which Good Friday falls, when the hours are 41½, and 48 hours in winter, except in the week in which Christmas Day falls, when the hours shall be 39½, with in addition, in the case of horsemen, cowmen and shepherds of 18 years of age and over, a sum of 6s. per week to cover employment up to 10 hours per week in connection with the immediate care of animals. The overtime rate for all male workers of 21 years of age and over is unchanged at 9d. per hour.

(2) An Order fixing special minimum rates of wages for employment during the corn harvest of 1934. The rate for male workers of 21 years of age and over employed on harvest work throughout the harvest period on farms of at least 60 acres of corn is not less than the ordinary minimum rate otherwise applicable, with in addition, a bonus of £5 payable on completion of the harvest period. The hours of work in respect of which this rate is payable are 11½ on any weekday while harvest work is in progress. For male workers of 21 years of age and over who do not work

MISCELLANEOUS NOTES

on the corn harvest throughout the period, or who are employed on farms of less than 60 acres of corn, the rate is 10d. per hour for all employment on harvest work.

Denbigh and Flint.—An Order fixing minimum and overtime rates of wages for male workers employed wholly or mainly in forestry, to come into force on August 12, 1934, and to continue in operation until February 15, 1935. The minimum rate for male workers of 21 years of age and over is 35s. per week of 50 hours with overtime at 9d. per hour.

Enforcement of Minimum Rates of Wages.—During the month ending August 14, legal proceedings were taken against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.	Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
Derby ...	Chesterfield	£ s. d. 0 0 0	£ s. d. 5 0 0	£ s. d. 16 13 4	2
" ...	Belper ...	1 0 0	0 10 0	5 18 9	1
Gloucester ...	Chipping Sodbury	12 0 0	0 10 0	32 11 11	3
Lincs. :					
Holland ...	Boston ...	1 0 0	0 12 0	11 0 0	1
" ...	" ...	2 0 0	0 6 0	9 0 0	1
Nottingham ..	Retford ...	1 0 0	0 10 6	20 18 0	1
" ...	Southwell	2 0 0	0 7 6	18 2 0	1
Yorks, W.R. ...	Pateley Bridge	5 0 0	3 3 0	32 0 0	1
		£24 0 0	10 19 0	146 4 0	11

* Dismissed under Probation of Offenders Act.

Wireless Talks to Farmers in September.—During September, Mr. John Morgan will continue his series of broadcast talks "For Farmers." These will be given on the National wave-length at 6.45 p.m. on Wednesdays only.

From Scottish Regional, there will be two special talks:—September 20 at 6.45 p.m., Dr. Alexander Calder on "The Present Position of the Pig Marketing Scheme"; and September 27 at 6.45 p.m., Mr. William R. Hunter on "The Handling and Classification of Meat." A series of talks for Scottish farmers only will be given on this wave-length beginning October 19.

A series of talks by a Midland farming correspondent is also being planned by Midland Regional. These will be given fortnightly, and will be complementary to Mr. Morgan's talks on the National wave-length.

APPOINTMENTS

County Agricultural Education Staffs

ENGLAND

Berkshire.—Mr. C. Kingsley, N.D.D., has been appointed Assistant Instructor in Dairying, *vice* Mr. C. J. Pope, N.D.A.

Leicestershire.—Mr. L. E. Edney, B.Sc., has been appointed Assistant Agricultural Organizer.

NOTICES OF BOOKS

NOTICES OF BOOKS

British Economic Grasses: Their Identification by the Leaf Anatomy. By Sydney Burr, M.Sc., and Dorothy M. Turner, B.Sc. Pp. xxii + 94, and 111 figs. (London: Edward Arnold & Co. 1933. Price 10s. 6d.)

This book is primarily intended for workers who are in need of a ready method of identification for the commoner British grasses when only vegetative material is available. In closely-grazed pastures, well-kept lawns and greens the flowering of individual plants is almost or entirely prevented, and their identification is not easy. In such instances it is necessary to rely on differences in habit and in the vegetative organs, or, failing these, differences in the anatomy of the leaf-blades. Those who are only able to use the last method for distinguishing different grasses will welcome the publication of this work.

The authors state that they have confined their account to the commoner native grasses that are generally met with in grassland investigations. In all, 54 kinds are described and illustrated. A few others might well have been included, such as *Agropyron pungens*, *Glyceria maritima*, *Koeleria gracilis* and *Phalaris arundinacea*, all of which are of economic importance.

In an introductory chapter the vegetative and anatomical characters of grasses are fully described. This is followed by two keys as aids to their identification, one utilizing vegetative characters, the other anatomical characters. The former key could have been somewhat improved. Contrasting characters are not always employed, and in a few cases the distinctions drawn between two species are of little use, e.g., *Aira flexuosa* and *Nardus stricta* (p. xv). Nevertheless, when used in conjunction with the other key and with the descriptions and illustrations it should be possible to identify all species with a fair degree of certainty.

The most important portion of the book is occupied by descriptions of the vegetative and microscopic characters of each species and full-page illustrations of sections of their shoots and leaf-blades. The latter are well-produced detailed line-drawings that reflect great credit on the authors for their patience and skill.

Change in the Farm. By T. Hennell. Pp. x + 201, and 37 illustrations by the Author. (Cambridge: University Press. 1934. Price 10s. 6d.)

This is a pleasantly-written and well-illustrated production that may be included amongst the increasing number of romantic works dealing with farming. The sub-title: "A record of rural industry in the days when farming was an art and the craftsman had not yet been ousted by the machine," throws a searchlight upon the mind of its author. It is a little astonishing in these days that farming under modern conditions should be regarded as less of an art than it was in the days when the manual labour involved was much greater and the farmer's life was much arduous. Few farmers and still fewer farm labourers would wish to return to the days so charmingly described by Mr. Hennell, but as a literary production and as a record of some of the older methods, there can be little but praise for this work. Unfortunately the book is marred by one or two serious errors. The author would carry few historians with him in his description of the farmhouse contained in Chapter I. His example was almost certainly a grange or manor house before it became a farmhouse, unless it was a building put up in the prosperous days of the late 18th, or early 19th, century. Again, in his mention of the three-field system Mr. Hennell states that the crop rotation followed was wheat, wheat, fallow. It is only possible to think that this statement is due to lack of careful proof-reading. In spite of these and similar defects, however, students of manners and customs, especially urban students, will find the book of interest.

NOTICES OF BOOKS

Making a University. By W. MacBride Childs, M.A., D.Litt., LL.D. Pp. xvi + 312, and 5 plans. (London: J. M. Dent & Sons Ltd. 1933. Price 6s.)

A University Extension College was founded at Reading in 1892, and in the following year the author of this monograph joined its staff, eventually becoming the Principal. Largely through his efforts the College developed into the University of Reading, which received its Royal Charter in 1926. Dr. Childs was appointed its first Vice-Chancellor, from which office he retired in 1929. He is thus able to trace from intimate personal experience the complete story of the university movement at Reading.

From the first prominence has been given to rural education. The university serves a wide agricultural district, and for a long time previous to its foundation the Board of Agriculture had considered the establishment of a department at Reading. There was also the prospect that Oxford might be willing to co-operate in the organization of the curriculum. The British Dairy Institute removed from Aylesbury to Reading in 1896, and two years later the Countess of Warwick established a hostel there for the reception and training of young women who, with the aid of the College, were to equip themselves for agricultural careers. This feminine venture, although it subsequently sought a home elsewhere, induced the Reading authorities to add horticulture to their syllabus. For these and similar reasons the predominant technical study has always been agriculture; indeed, in popular parlance the place has sometimes been described as "the Agricultural College at Reading."

An important event in the history of the College was the establishment of a dairy research station. In 1912 the Board of Agriculture made a grant of £2,000 per annum, and assisted the erection of the necessary buildings. In the same year Mr. John Golding was appointed research chemist in dairying, and the late Dr. Stenhouse Williams research bacteriologist. To-day the National Institute of Research in Dairying has a staff of 24 persons, exclusive of laboratory assistants, and occupies extensive premises at Shinfield, adjacent to the original university farm and the horticultural station. In Dr. Childs's opinion this advance was "due mainly to the continuous support of the Board of Agriculture" and the munificence of the Institute's chairman, the Earl of Iveagh.

The achievement outlined above is related in detail in Dr. Childs's pleasantly-written volume, which will appeal not only to friends of Reading, but also to the wider public that is interested in constructive educational efforts.

The Life of the Rook. By G. K. Yeates, Pp. 95 and 22 Figs. (London: Philip Allan & Co. Ltd. 1934. Price 10s. 6d.)

In his introduction to this book the author says: "Economically and from the farmer's point of view the rook is, of course, of the greatest importance. Upon this side alone of the many parts of a rook's life I have not ventured." Many readers will regret this fact, and will be disappointed that the volume makes no contribution of importance to the controversy as to the rook's economic status. The naturalist and bird-lover, however, cannot fail to be interested, for this is a good and very readable record of painstaking observation, and is probably the best and fullest account of the "home life" of the rook that has yet been published. Many of Mr. Yeates's facts are new, and the work as a whole is a valuable addition to our ornithological literature. It is characterized by a pleasing modesty and diffidence in suggestion, but it is not to be supposed that the author's views need any apology on presentation, for the notes are too carefully and conscientiously made to permit of any doubt as to the accuracy of his observations. His chapters on the construction of

NOTICES OF BOOKS

"hides" will be welcomed by bird photographers generally. If there is nothing very new in his ideas on this subject, they are at least sound and reliable. The author's photographs are good, some of them exceptionally so.

Silo-Sparwirtschaft (*The Silo for Forage Crop Conservation*).

By L. F. Kuchler. Pp. 250. Illus. (Munich: Knorr & Hirth, Sendlingerstr. 80. Price RM. 4.20; stiff covers 5.20.)

In a campaign directed to render Germany more and more independent of imported foodstuffs the necessity for improving pasture farming is emphasized. Not only is it necessary that higher yields of forage crops containing greater proportions of essential nutrients should be produced by the agricultural community, but the latest methods of conservation must be adopted in order that full advantage may be taken of the products. To this end the use of the silo must be widely developed, as it provides for the conservation of the harvest of meadow and pasture, as well as cultivated forage, in its optimum condition. Development in this direction must result in the improvement of livestock, with a consequent result of increase in supplies of foodstuffs from home sources for the German people. Herr Kuchler has conducted experiments in fodder crop conservation for very many years, and his book is considered fundamental to the modern farmer who desires to make himself acquainted with the latest methods adopted. The most important chapters of the book are entitled "The present position of forage production"; "The necessary principles underlying the intensified development of forage preservation"; "The economic necessity for a more extended use of the silo for forage conservation and improved cattle feeding"; "The bearing of improved fodder by silo conservation on the country population on land-settlement schemes and on employment"; "Silage development results and hindrances in Bavaria up to date." The book is completed by a large number of illustrations showing the development of forage crop preservation from the earliest times.

Advisory Report on Arable Land, Sheep Husbandry and Poultry Keeping in Wiltshire. Edited by W. T. Price, M.C., N.D.A.,

N.D.D. Pp. 96. (Wilts. County Education Office, Polebarn House, Trowbridge.)

A previous Advisory Report issued by the Wiltshire Agricultural Education Committee dealt with Manuring and the Management of Grassland. The subjects treated in the present report form three of the most important elements in the agriculture of the county. The advice given is of a practical character, and chiefly based on experimental work. While primarily applicable to local conditions, it may be read with profit by farmers throughout the country.

Általános talajtan (*Soil Science*). By A. de 'Sigmund. Pp. xii + 696, with 72 Figures in text and 4 black-and-white and 1 coloured folding plates. (Budapest: 1934. Published by the author.)

This comprehensive work, written in Hungarian, is evidence of the serious attention now being given to soil science and soil amelioration in Hungary. Amongst works in English, only Professor G. W. Robinson's book on soils covers similar ground. Whereas Sir John Russell's "Soil Conditions and Plant Growth" regards the soil primarily as a medium for the growth of plants, and only secondarily as a structural entity, Professor 'Sigmund here reverses the emphasis.

Általános talajtan is divided into four main portions: Formation and genetics; Properties and inhabitants; Classification; and Mapping. The first part contains sections on geological, petrographic, climatic, and orographical factors in soil formation. Further sections treat of the effects of plants, animals, the soil micro-population, and man, upon the genesis of soil. The second part includes sections on soil

NOTICES OF BOOKS

physics and on some chemical and colloidal properties of soil: this part could have been strengthened if more reference had been made to work on soil physics than has appeared during the past twenty years. A monograph on the microfauna, by Dr. Telegdy Kováts, is competent, but a section by another author on bacteria and fungi suffers from over-compression and the material does not appear to have been judiciously selected.

In the next part, Classification, the author is entirely at his ease, and one could wish that the whole book were of the same standard. No better introduction to the newer dynamical views on soil structure could be desired. The coloured plate is attractive and instructive. Elsewhere there is evidence of lack of care in revision. Thus, the table giving nitrogen contents of rain-water confuses parts per hundred thousand and per million. It may be of interest to mention that a summary of Professor 'Sigmond's ideas on soil classification is available in English in "Soil Research" (1933), Vol. 3, pp. 103-127.

Plants and Human Economics. By Ronald Good, M.A. Pp. xii + 202, and 8 maps. (Cambridge: University Press. 1933. Price 5s.)

Mr. Good is to be congratulated on providing a school and university text-book on economic botany. It is only a small minority of students who are able to appreciate any science for its own sake, and it is very desirable to have some "peg" on which to hang the numerous facts required by the present-day examination system. Botany is no exception, and it is rather remarkable that one of the most attractive "pegs," namely the relation between plants and man, is so little utilized in schools and universities. The author's object has been "to combine in small compass and, it is hoped, in reasonable and readable fashion, not only the botanical facts but also, and frequently more important, the historical and economic facts required to give to those who begin the scientific study of botany an adequate humanistic background of reality to their subject." With these aims in view he has produced an attractive and readable volume that should have a wide circulation. The first five chapters are devoted to general considerations, both botanical and economic, under the heading "Introductory," "The Nature and Sources of Food," "The Life of the Green Plant," "Factors Limiting Agricultural Production," and "Science and Agriculture," where a brief but comprehensive summary of the history and importance of the application of scientific methods to agriculture is given. The next seven chapters are devoted to the description of the different classes of economic plant products, such as "Cereals and Pulses," "Vegetables: Salad Plants: Fruits," etc., each section being further sub-divided and brief mention being made of all the important plants in each class.

The final chapter consists of a survey of the economic history of Great Britain from the beginning of the 18th century to the present day, emphasizing the interplay of social and economic factors and their effect on the demand and supply of food. A clear and concise picture is given, though the author, in such phrases as "steam and iron together made machinery, and with machinery all things were possible," has perhaps occasionally sacrificed sober statement to an epigrammatic ellipsis.

One of the most valuable features of the book is the series of eight maps, six of which show the distribution of the more important cultivated crops in each continent, while the remaining two illustrate the world distribution of vegetational types, and oil- and coal-fields respectively.

A book on these lines has long been wanted, and Mr. Good's volume, published at the very reasonable price of 5s., is in every way admirably suited to its purpose.

SELECTED CONTENTS OF PERIODICALS

Agricultural, General and Miscellaneous

- Factors Affecting Some Types of Farming in Devon and Cornwall. *W. H. Long*. (Jour. Roy. Agric. Soc. Eng., 94 (1933), pp. 42-61.)
- Notable Farming Enterprises, IV. (i) A Commercial Experiment in Poultry Farming, *H. J. Denham*; (ii) Some Tweedside Farms, *J. A. Hanley*. (Jour. Roy. Agric. Soc. Eng., 94 (1933), pp. 83-121.)
- Fenland Farming. *J. C. Wallace*. (Agric. Prog., 11 (1934), pp. 52-65.)
- An Economist's View of the Farming in Nidderdale. *A. G. Ruston* and *A. B. Turnbull*. (Agric. Prog., 11 (1934), pp. 66-70.)
- The Agricultural Geography of the Eastern Counties. *R. McG. Carslaw*. (Agric. Prog., 11 (1934), pp. 70-76.)
- Soil Survey of North Shropshire. Pt. 1. Geography, Geology, Parent Materials, Soils. *W. M. Davies* and *G. Owen*. (Emp. Jour. Exp. Agric., 2, 6 (April, 1934), pp. 178-188, 1 pl.)
- Grossbritannien. *A. Young's* erste Farmbetriebsaufnahme, 1769. *G. E. Fussell*. (Ber. u. Ldw., 19, 1 (1934), pp. 117-123.)
- An Early Scottish Improver (William Mackintosh). *A. M'Callum*. (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 172-181.)
- Empire Agriculture. *F. L. McDougall*. (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 145-153.)
- The Value of Physical Data in Farm Management Problems. *W. H. Long*. (Jour. Proc. Agric. Econ. Soc., 3, 1 (March, 1934), pp. 40-50.)
- The Connection between Tenant-Right Valuation and Farming Efficiency. *E. P. Weller*. (Jour. Proc. Agric. Econ. Soc., 3, 1 (March, 1934), pp. 51-63.)
- The Application of Electricity to Agriculture. *Sir W. Ray*. (Jour. Farmers' Club, 1934, Pt. 4 (May), pp. 63-80.)
- The Effect of Soaking in Water on the "Seeds" of Some Gramineæ. *H. G. Chippindale*. (Ann. App. Biol., 21, 2 (May, 1934), pp. 225-232.)
- The Use of Sodium Fluoride in Salt for Hide Preservation. *M. E. Robertson*, *R. H. Marriott*, and *F. E. Humphreys*. (Jour. Soc. Chem. Ind. (Trans. Comm.) 53, 12 (Mar. 23, 1934), pp. 83T-89T.)
- The Use of Commercial Pectins in Home-Made Jams, *M. L. Adams*. (Jour. Bath & West & Southern Counties' Soc., 6th Ser., 8 (1933-34), pp. 190-194.)
- Experiments on the Improvement of the Juice from Culinary and Dessert Apples by Maceration with Pressed Bittersweet Pomace. Progress Report. *P. T. H. Pickford*. (Jour. Bath & West & Southern Counties Soc., 6th Ser., 8 (1933-34), pp. 186-189.)
- The Reclamation of Moorland. *W. G. Ogg* and *I. M. Robertson*. (Emp. Jour. Exp. Agric., 2, 6 (April, 1934), pp. 163-173.)
- The Pollution of Farm Water Supplies by Sewage Effluents. *B. Thomas*. (Agric. Prog., 11 (1934), pp. 164-169.)
- The Land Drainage Act, 1930. *F. M. Farmer*. (Trans. Chart. Surv. Inst., 66, 6 (1933-1934), pp. 264-290.)
- The Operation of Mole Drains. *H. H. Nicholson*. (Agric. Prog., 11 (1934), pp. 156-164.)
- The Durability of Mole Drains. *H. H. Nicholson*. (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 185-191, 2 pl.)

Agricultural Economics

- The State and Agriculture. *J. A. Venn*. (Jour. Proc. Agric. Econ. Soc., 3, 1 (March, 1934), pp. 13-24.)

SELECTED CONTENTS OF PERIODICALS

The Relation of the Agricultural Economist to Practical Farm Management. *J. R. Currie*. (Jour. Proc. Agric. Econ. Soc., 3, 2 (May, 1934), pp. 94-104.)

The Distribution of the Agricultural Income. *D. A. E. Harkness*. (Jour. Proc. Agric. Econ. Soc., 3, 1 (March, 1934), pp. 25-39.)

Agricultural Education

University Training in Agriculture: The Importance of the Practical. *H. G. Miller*. (Agric. Prog., 11 (1934), pp. 41-48.)

Education for Management. *W. R. Dunlop*. (Agric. Prog. 11 (1934), pp. 49-51.)

Young Farmers' Clubs. *O. W. Drew*. (Jour. Brit. Dairy Farmers' Assoc., 46 (1934), pp. 69-76.)

Agricultural Marketing

The Agricultural Marketing Act, 1933. *A. W. Street*. (Jour. Roy. Agric. Soc. Eng., 94 (1933), pp. 1-21.)

The Agricultural Marketing Act, 1933. *R. C. Hinton*. (Jour. Proc. Agric. Econ. Soc., 3, 2 (May, 1934), pp. 70-81.)

Market Intelligence: Collection and Uses. *G. S. Dunnnett*. (Jour. Proc. Agric. Econ. Soc., 3, 2 (May, 1934), pp. 82-93.)

Organised Marketing in Relation to Progress in Production. *J. Ll. Davies*. (Jour. Proc. Agric. Econ. Soc., 3, 2 (May, 1934), pp. 105-112.)

The National Mark. *R. C. Hinton*. (Jour. Bath & West & Southern Counties Soc., 6th Ser., 8 (1933-34), pp. 45-50.)

The Report of the Reorganisation Commission for Fat Stock. *Sir H. Trustram Eve*. (Jour. Farmers' Club, 1934, Pt. 5 (June), pp. 81-102.)

The Pigs Marketing Scheme and its Working. *D. Black*. (Jour. Farmers' Club, 1934, Pt. 1 (Feb.), pp. 1-21.)

Grading Meat: The Prices Given for Different Weights and Qualities. *J. Hammond* and *G. N. Murray*. (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 233-249.)

Agricultural Research

Field Experimentation—The Modern Technique. *J. Wishart*. (Agric. Prog., 11 (1934), pp. 149-156.)

The Value of Covariance in Analysing Field Experimental Data. *F. H. Garner*, *J. Grantham* and *H. G. Sanders*. (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 250-259.)

Methods of Experimentation in Animal Nutrition. *E. J. Sheehy*. (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 312-314.)

Reply to Note by E. J. Sheehy on Methods of Experimentation in Animal Nutrition. *G. Dunlop*. (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 335-339.)

Observer's Bias in Sampling—Observations on Wheat. *F. Yates* and *D. J. Watson*. (Emp. Jour. Exp. Agric., 2, 6 (April, 1934), pp. 174-177.)

On the Measurement of Imbibitional Water. *E. W. Russell* and *R. S. Gupta*. (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 315-325.)

Manures and Fertilizers

Investigations of the Manurial Effectiveness of Ammonium Phosphate. Pt. I. Introductory and Historical. *A. H. Lewis* and *K. J. Sinclair*. (Emp. Jour. Exp. Agric., 2, 6 (April, 1934), pp. 154-162.)

The Fertilizer Value of Basic Slags and Other Phosphates. *E. M. Crowther* and *R. G. Warren*. (Agric. Prog., 11 (1934), pp. 99-105.)

Observations on the Effect of Various Fertilizers on Soil Acidity. *A. Lauder* and *A. M. Smith*. (Agric. Prog., 11 (1934), pp. 93-98.)

SELECTED CONTENTS OF PERIODICALS

Green Manuring and Sheep Folding on Light Land. An Account of the Green Manuring Experiments at the Woburn Experimental Station, 1893-1933. *E. M. Crowther and H. H. Mann.* (Jour. Roy. Agric. Soc. Eng., 94 (1933), pp. 128-151.)

Field Crops

- The Improvement of the Oat Crop in Ireland. *M. Caffrey.* (Jour. Dept. Agric., Irish Free State, 32, 2 (1933), pp. 216-233.)
- The Quality of Wheat as Influenced by Environment. *F. T. Shutt and S. N. Hamilton.* (Emp. Jour. Exp. Agric., 2, 6 (April, 1934), pp. 119-138.)
- The Culture of Barley for Brewing. *E. S. Beaven.* (Jour. Inst. Brewing, 31 (New Series), 5 (May, 1934), pp. 188-203, 4 pl.)
- Some Factors Influencing Lodging in Cereals. *J. Brady.* (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 209-232.)
- The Effect of Sodium Nitrate on the Growth and Nitrogen Content of a Lucerne and Grass Mixture. *H. G. Thornton and H. Nicol.* (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 269-282.)
- A New Assessment of the Effects of Manuring on the Tree Field Plots at Cockle Park. *B. Thomas and F. J. Elliott.* (Jour. Bath & West & Southern Counties Soc., 6th Ser., 8 (1933-34), pp. 37-45.)
- Research in Relation to the Production of "Good" Potato Seed. *R. N. Salaman.* (Agric. Prog., 11 (1834), pp. 77-86.)
- The Storage of New Potatoes. *A. M. Smith.* (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 202-207.)

Grassland

- Grassland Management and Its Influence on the Sward. *M. G. Jones.* (Jour. Roy. Agric. Soc. Eng., 94 (1933), pp. 21-41.)
- Investigations in Pasture Production VI. Studies of Effect of Sulphate of Ammonia and Frequency of Cutting on Production of Pasture under System of Mowing only. *A. W. Hudson.* (New Zealand Jour. Agric., 48, 1 (Jan. 20, 1934), pp. 17-22.)
- The Longleat Experiments, 1927-1931. *A. W. Ling, W. R. Muir and J. D. Nutt.* (Jour. Bath & West & Southern Counties Soc., 6th Ser., 8 (1933-34), pp. 51-77.)
- Grassland Tendencies and Hopes. *G. Turnbull.* (Jour. Brit. Dairy Farmers' Assoc., 46 (1934), pp. 66-68.)
- Grassland Retrogression in Devonshire Permanent Pastures. *E. Wyllie Fenton.* (Jour. Ecol., 22, 1 (February, 1934), pp. 279-288.)

Horticulture

- A Complex Experiment in the Propagation of Plum Rootstocks from Root Cuttings. Season, 1931-32. *T. N. Hoblyn and R. C. Palmer.* (Jour. Pom. Hort. Sci., 12, 1 (March, 1934), pp. 36-56, 2 pl.)
- The Influence of Winter Stem Pruning on Subsequent Stem and Root Development in the Apple. *R. C. Knight.* (Jour. Pom. Hort. Sci., 12, 1 (March, 1934), pp. 1-14.)
- Cider Fruit Culture in Relation to Modern Requirements. *B. T. P. Barker.* (Jour. Bath & West & Southern Counties Soc., 6th Ser., 8 (1933-34), pp. 7-27.)
- Strawberry Culture, I. *D. V. Howells.* (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 153-166.)
- Experiments on Lawns. *W. M. Findlay.* (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 181-189.)

Plant Pests, Diseases, etc.

- I. Some Physiological Disorders of Glasshouse Crops. *W. F. Bewley.* II. Some Physiological Disorders of Fruit Trees. *T.*

SELECTED CONTENTS OF PERIODICALS

- Wallace.** III. Injection for the Diagnosis and Cure of Physiological Disorders of Fruit Trees. **W. A. Roach.** (Proceedings of the Association of Applied Biologists, Dec. 1, 1933—Ann. App. Biol., 21, 2 (May, 1934), pp. 319-343.)
- Studies in Bacteriosis. XX. The Spraing Disease of Potato Tubers. **B. J. Grieve.** (Ann. App. Biol., 21, 2 (May, 1934), pp. 233-250, pl. xiii and xiv.)
- Some Aspects of the Plant Virus Problem. **K. M. Smith.** (Agric. Prog., 11 (1934), pp. 88-92.)
- The Physiology of Virus Diseases in Plants. V. The Movement of the Virus Agent in Tobacco and Tomato. **J. Caldwell.** (Ann. App. Biol., 21, 2 (May, 1934), pp. 191-205, pl. x.)
- The Physiology of Virus Diseases in Plants. VI. Some Effects of Mosaic on the Metabolism of the Tomato. **J. Caldwell.** (Ann. App. Biol., 21, 2 (May, 1934), pp. 206-224, pl. xi and xii.)
- Some Factors Affecting the Inactivation Rate of the Virus of Tomato Spotted Wilt. **J. G. Bald** and **G. Samuel.** (Ann. App. Biol., 21, 2 (May, 1934), pp. 179-190.)
- Botrytis Disease of Lettuce. **M. M. Abdel-Salam.** (Jour. Pom. Hort. Sci., 12, 1 (March, 1934), pp. 15-35, 1 pl.)
- A Summary of Recent Investigations on Apple Scab. **R. W. Marsh.** (Jour. Bath & West & Southern Counties Soc., 6th Ser., 8 (1933-34), pp. 148-155.)
- Spraying and Dusting Experiments on the Control of Apple Scab (*Venturia inaequalis*) and Apple Mildew (*Podosphaera Leucotricha*) at East Malling in 1931-32. **M. H. Moore.** (Jour. Pom. Hort. Sci., 12, 1 (March, 1934), pp. 57-79, 4 pl.)
- The Incidence and Control of Loose Smut and Leaf Spot of Oats. **R. McKay.** (Jour. Dept. Agric., Irish Free State, 32, 3 (1933), pp. 234-256.)
- A Phytophthora Disease of Snapdragons. **M. R. Harris.** (Phytopathology, 24, 4 (April, 1934), pp. 412-417.)
- A Study of the Potato Eelworm (*Heterodera schachtii*) in the Irish Free State. **J. Carroll.** (Jour. Dept. Agric., Irish Free State, 32, 2 (1933), pp. 183-201, 7 pl.)
- Observations on the Pea Strain of the Eelworm (*Heterodera schachtii*) and its Relation to "Pea Sickness." **C. L. Walton, L. Ogilvie** and **B. O. Mulligan.** (Jour. Bath & West & Southern Counties Soc., 6th Ser., 8 (1933-34), pp. 155-167, 2 pl.)
- Studies on Aphides Infesting the Potato Crop. II. Aphis Survey: Its Bearing upon the Selection of Districts for Seed Potato Production. **W. M. Davies.** (Ann. App. Biol., 21, 2 (May, 1934), pp. 283-299, pl. xv and xvi.)
- On the Pigmy Mangold Beetle (*Atomaria Linearis* Steph.) and Methods for Its Control. **E. E. Edwards** and **J. K. Thompson.** (Ann. App. Biol., 21, 2 (May, 1934), pp. 300-318, pl. xvii and xviii.)
- Field Experiments on the Prevention of Cereal Rusts by Sulphur Dusting (1930-1932). **F. J. Greaney.** (Sci. Agric., 14, 9 (May, 1934), pp. 496-511.)
- Experiments on Control of Some Cereal Diseases by Seed-Dusting. **J. C. Neill.** (New Zealand Jour. Agric., 48, 4 (April, 1934), pp. 234-237.)
- The Eradication of Weeds in Cereal Crops by Dilute Sulphuric Acid. **G. E. Blackman.** (Agric. Prog., 11 (1934), pp. 173-175.)
- Control of Bracken in Scotland. (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 221-223.)

Live Stock and Feeding

- The Development of Bacon Pig Production in Great Britain. **H. R. Davidson.** (Jour. Brit. Dairy Farmers' Assoc., 46 (1934), pp. 59-65.)

SELECTED CONTENTS OF PERIODICALS

- Conformation and Development of the Bacon Pig. *J. Hammond.* (Agric. Prog., 11 (1934), pp. 127-129.)
- A Study of the Fasting Metabolism of Various Breeds of Hog. I. Introductory: Age, Weight and Length Data, etc. *T. Deighton.* (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 326-334.)
- Cod Liver Oil in Pig Feeding. *E. J. Sheehy.* (Jour. Dept. Agric., Irish Free State, 32, 2 (1933), pp. 202-215.)
- Report of Experiments on the Use of Sugar Pulp in Fattening Cattle. (Jour. Dept. Agric., Irish Free State, 32, 2 (1933), pp. 277-285.)
- Twinning in Cattle. *A. C. T. Hewitt.* (Jour. Dairy Res., 5, 2 (April, 1934), pp. 101-107.)
- Cattle Feeding. Note from Auchincruive Agricultural College. (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 212-214.)
- Some Results of Fattening Bullocks in Open Yards. *F. Rayns and E. T. Sykes.* (Jour. Roy. Agric. Soc. Eng., 94 (1933), pp. 62-82.)
- The Disposal of Sugar Beet By-Products: Sheep Fattening on Sugar Beet Tops. *F. Rayns.* (Jour. Roy. Agric. Soc., Eng., 94 (1933), pp. 151-160.)
- The Calcifying Properties of Green, Artificially Dried and Sun-Cured Pasture Herbage. *R. E. Hodgson and J. C. Knott.* (Jour. Agric. Res., 48, 5 (March 1, 1934), pp. 439-446.)
- The Standardization of Quality of Home-Milled Fine Wheatfeed. *T. Shaw.* (Agric. Prog., 11 (1934), pp. 169-173.)
- Nutritive Value of Lucerne. II. Investigations into the Influence of Systematic Cutting at Three Different Stages of Growth on the Yield, Composition and Nutritive Value of Lucerne. *H. E. Woodman, R. E. Evans and D. B. Norman.* (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 283-311.)
- The Nutritive Value of Legume Husks. *R. G. Linton, A. N. Wilson and S. J. Watson.* (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 260-268.)
- Observations on the Feeding of Different Fats to Poultry. *E. M. Cruikshank.* (Agric. Prog., 11 (1934), pp. 147-148.)
- Ground Oats as a Substitute for Wheat Bran and Wheat Middlings in Rations for Chicks, *R. E. Roberts and C. W. Carrick.* (Poultry Sci., 13, 3 (May, 1934), pp. 135-140.)
- Progress in Goatkeeping. *T. W. Palmer.* (Jour. Brit. Dairy Farmers' Assoc., 46 (1934), pp. 77-88.)

Dairying

- Efficiency in Dairying and Some Economic Results. *A. W. Ashby.* (Jour. Brit. Dairy Farmers' Assoc., 46 (1934), pp. 32-48.)
- Dairying in Cornwall. *A. Gregg.* (Jour. Brit. Dairy Farmers' Assoc., 46 (1934), pp. 49-58.)
- The Need for a Sincere Standard of Excellence in Dairy Cattle. *R. Boutflower.* (Jour. Farmers' Club, 1934, Pt. 3 (April), pp. 41-61.)
- The Progeny Testing of Dairy Bulls. *J. Mackintosh.* (Jour. Brit. Dairy Farmers' Assoc., 46 (1934), pp. 11-31.)
- Changes and Events in a Large Dairy Herd from 1912 to 1932. *J. Hunter-Smith.* (Emp. Jour. Exp. Agric., 2, 6 (April, 1934), pp. 139-153.)
- The Feeding Value of Artificially Dried Pasture Herbage for Milk Production. *J. C. Knott and R. E. Hodgson.* (Jour. Dairy Sci., 17, 5 (May, 1934), pp. 409-416.)
- The Nutritive Value of Proteins for Milk Production. III. The Determination of the Amino Acids of Various Feeds. *S. Morris.* (Jour. Dairy Res., 5, 2 (April, 1934), pp. 108-112.)

SELECTED CONTENTS OF PERIODICALS

- The Mineral and Vitamin Requirement of Dairy Cattle. *J. A. Crichton*. (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 197-201.)
- A Scheme for the Improvement of Dairy Cattle in Bucks. *J. Porter*. (Agric. Prog., 11 (1934), pp. 135-138.)
- The Effect of Night Itself upon Milk Production in Dairy Cattle. *K. W. D. Campbell*. (Agric. Prog., 11 (1934), pp. 139-143.)
- An Improvement in the Method for Determining the Hardness of Curd from Milk. *A. Lauder, J. McGillivray and A. Comrie*. (Agric. Prog., 11 (1934), pp. 121-126.)
- Phosphatase and the Phosphorus Compounds of Milk. *W. R. Graham, Jr., and H. D. Kay*. (Agric. Prog., 11 (1934), pp. 119-121.)
- Milk Tests. *J. Golding*. (Agric. Prog., 11 (1934), pp. 115-119.)
- Coliform Bacteria in Milk. *J. F. Malcolm*. (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 189-197.)
- Bacteria in Raw and Pasteurised Milk. *R. H. Leitch*. (Scot. Jour. Agric., 17, 2 (April, 1934), pp. 166-172.)
- Variations in the Solids-not-fat Content of Milk, I and II. *S. Bartlett* (Jour. Dairy Res., 5, 2 (April, 1934), pp. 113-123.)
- The Fat Percentage of Milk as Affected by Feeding Fats to Dairy Cows. *N. N. Allen*. (Jour. Dairy Sci., 17, 5 (May, 1934), pp. 379-395.)
- A Study of Factors Influencing the Keeping Quality of Some Victorian Salted Butters in Cold Storage. *G. Loftus-Hulls, L. R. Scharp and T. S. Bellair*. (Jour. Dairy Res., 5, 2 (April, 1934), pp. 124-136.)
- A Study of the Quantitative Changes in the Microbiological Flora of Sweet-cream Salted Butter of Good Keeping Quality when held at 15° F for a Period of Two to Eight Months. *M. Grimes and A. J. Hennerty* (Jour. Dairy Res., 5, 2 (April, 1934), pp. 137-143.)
- Investigation to Test Chemically and Bacteriologically the Effect of Cold Storage on the Keeping Qualities of Irish Free State Creamery Butter (II, 1931-32) (2nd Series). *P. S. Arup and G. van B. Gilmour*. (Jour. Dept. Agric., Irish Free State, 32, 2 (1933), pp. 257-272.)
- The Bearing of Hydrogen Ion Concentration on the Flavour of Irish Free State Creamery Butter. *G. van B. Gilmour*. (Jour. Dept. Agric., Irish Free State, 32, 2 (1933), pp. 273-276.)
- Studies in Cheddar Cheese. II The Effect of Controlled Oxidation-reduction Potential on Ripening. III. The Role of Rennin, Pepsin and Lactobacilli. *W. L. Davies, J. G. Davis, D. V. Dearden, and A. T. R. Mattick*. (Jour. Dairy Res., 5, 2 (April, 1934), pp. 144-152.)
- Recent Advances in Dairy Science. A Symposium. (Agric. Prog., 11 (1934), pp. 7-34.)

Veterinary Science

- The Epidemiology of Parasitic Gastritis in Sheep. Observations on the Relative Importance of the Various Factors concerned in the Development of the Disease. *E. L. Taylor*. (Jour. Agric. Sci., 24, 2 (April, 1934), pp. 192-208.)
- Bovine Contagious Abortion. *T. M. Doyle*. (Jour. Farmers' Club, 1934, Pt. 2 (March), pp. 23-40.)
- The Influence of Temperature on the Activity of Sheep-Blowflies. *A. J. Nicholson*. (Bull. Ent. Res., 25, 1 (March, 1934), pp. 85-99.)
- The Sheep Blowfly Problem in North Wales. *W. M. Davies*. (Ann. App. Biol., 21, 2 (May, 1934), pp. 267-282.)
- The Problem of Parasitic Round-Worms in Sheep. *J. B. Orr, A. H. H. Fraser and D. Robertson*. (Jour. Yorks. Agric. Soc., 1934, pp. 35-38.)

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 7 October, 1934

NOTES FOR THE MONTH

Marketing Schemes and Public Health

A CERTAIN amount of interest has been aroused recently in the importance of a correct diet in maintaining health. Until a few years ago it was generally assumed that if people had enough food to satisfy their appetite, and if there was no actual starvation, they could be considered adequately nourished. It is now known that it is important not only to have enough food, but to have enough of the right kind of food, and that many forms of ill-health can be cured by a proper attention to diet.

From a national point of view this knowledge is important in view of the heavy expenditure of the State in the control of disease through the medical and social services. It seems likely that part at least of this could be saved or better spent if all classes of the people could be assured a properly-constituted diet. This was recognized by the Elgin Committee on Agriculture for Scotland, which came to the conclusion that "it is in the interests of the State that the price of food should be kept so low that the poorest can obtain an adequate dietary." Unfortunately at present it is the foodstuffs of special value for maintaining health that are relatively expensive, and it seems certain that in many households the money available is not sufficient to provide a properly balanced diet even where the housewife is a skilful buyer and makes the best use of the sum that is available for food.

The real problem is, as Dr. J. B. Orr points out in a recent lecture,* to supply the community with an abundance of cheap, fresh foodstuffs, and yet ensure that

* The National Food Supply and its Influence on Public Health, Chadwick Lecture, 1934. P. S. King & Son, Ltd., London, price 6d.

NOTES FOR THE MONTH

the farmer who produces them shall receive an adequate return for his labour. The farmer has, for the last few years, been living on his capital, and Dr. Orr recognizes that the present Government has made "herculean efforts" to relieve agriculture and maintain the rural population; but he suggests that before any more steps are taken to help the farmer by limiting the amount of any foodstuffs to be sold, or by fixing retail prices, an attempt should be made to determine the extent to which the disease and ill-health prevalent in the community are attributable to faulty diet. This might be done by taking, say, 10,000 families in one of the depressed areas and ensuring that they had an adequate diet for a period of at least five years. It would then be possible to ascertain to what extent the faulty diet was due to poverty; and the effect that the raising or lowering of food prices would have on State expenditure for employment and poor relief, and on medical and social services, could be measured.

Pointing out one possible solution of the problem of high prices for foodstuffs, Dr. Orr draws attention to the recommendation of the Elgin Committee that the methods of distribution should be completely reorganized to reduce "the wide and growing difference" between the price received by a producer and that paid by the consumer, and to give the consumer a better and cheaper product. The Committee recommended that the Marketing Boards (modified in constitution) should establish central depots in each town for certain main foodstuffs. The produce would be moved from the farm direct to the centres, where it would be graded, and payment would be made to the farmer according to quality. The retail distributor would get his goods from this centre, but the poorer consumers would be able to save the costs of retail distribution by purchasing their supplies at the central depot or at a convenient sub-depot.

Storage of Chickens in Carbon Dioxide

THE following note has been communicated by Dr. E. C. Smith, Low Temperature Research Station, Cambridge:—

Experiments that have recently been carried out at the Low Temperature Research Station, Cambridge, have had as their aim the preservation of chickens in an unfrozen

NOTES FOR THE MONTH

state for periods of four to six months. The success of gas storage of beef, pork, bacon and eggs suggested that this might prove a useful means of dealing with poultry, but the results have been disappointing.

Without entering into details, the failure of the method can be attributed to two unexpected causes.

(i) The first defect appears almost immediately the birds are put in carbon dioxide. Apparently the gut wall is permeable to this gas, but impermeable to air, so that the former passes in but the latter cannot get out. The result is, that the crop and intestine swell, and form large "blisters" at the base of the neck and at the vent. Lower concentrations of carbon dioxide would diminish this effect, but to give the four-months' storage aimed at, at least 70 per cent. of carbon dioxide is necessary.

(ii) The second defect, however, would still limit storage to about two months at the temperature ($30-31^{\circ}$ F.) at which the recent experiment was carried out.

The pancreas and duodenum, which secrete extremely active digestive enzymes, lie close to the right wall of the abdomen. After about two months, a green discoloration begins to appear on this area, and subsequently the tissues break down and liquefy until, after 12 weeks, definitely the limit of saleability of most of the birds is reached. There is no putrefaction, and little odour, but on cooking, the whole of the belly wall breaks away and the surrounding tissues acquire a bitter taste.

The time of storage necessary to take advantage of the seasonal variation in price of chickens cannot, therefore, be secured by this means. Actually, for this limited period before digestion begins to show, storage in air would probably give better results than gas storage. By rapidly cooling the chickens to $29-30^{\circ}$ F. and holding them at this temperature in a slightly drying atmosphere, it should be possible to store the birds for two months without undue depreciation. This would at any rate allow the producer to smooth out minor market fluctuations.

Tithe Rentcharge

THE Royal Commission on Tithe Rentcharge held a preliminary meeting on September 7, 1934, under the chairmanship of Sir John Fischer Williams, C.B.E., K.C., in order to settle the procedure to be adopted in connexion

NOTES FOR THE MONTH

with the Commission's inquiry. All the members were present.

It will be recollected that the terms of reference of the Commission are:—

“To inquire into and report upon the whole question of tithe rentcharge in England and Wales and its incidence, with special reference to stabilized value, statutory remission, powers of recovery and method and terms of redemption.”

The Commission has already received a number of offers to submit evidence, and invitations to appear before the Commission have been addressed to the principal bodies interested in the question of tithe rentcharge. Any body or person interested who has not yet received a communication from the Commission, and who desires to be heard, should communicate with the Secretary of the Commission, 3, Sanctuary Buildings, Great Smith Street, Westminster, S.W.1, submitting, in the first instance, a written statement of the evidence proposed to be given.

Management in Agriculture

ARRANGEMENTS are in progress for the agricultural section of the Sixth International Congress for Scientific Management, to be held in London next July. At the Council Meeting of the Congress held on June 28 last it was stated that agricultural management would occupy a prominent place in the Congress programme. The special Agricultural Committee, under the chairmanship of Sir George Courthope, includes representatives of the National Farmers' Union, the Central Landowners' Association, the Royal Agricultural Society and the Agricultural Economics Society; the Ministry of Agriculture is also giving active support.

The subject to be specially considered is standardization as a factor in agricultural development, including standardization of equipment, methods and produce.

Papers are being prepared by Mr. C. S. Orwin, Director of the Agricultural Economics Research Institute at Oxford; Mr. R. McG. Carslaw, Cambridge School of Agriculture; Mr. A. W. Street, Principal Assistant Secretary, Ministry of Agriculture; and Mr. F. Rayns, Agricultural Organizer for Norfolk. Professor J. Scott Watson, School of Rural Economy, Oxford; Mr. James Wyllie, South-Eastern Agricultural College, Wye; Sir John Russell, Director of the Rothamsted Experimental Station; and Mr. J. H. Wain, Vice-President of the National Farmers'

NOTES FOR THE MONTH

Union, have agreed to act as rapporteurs for the agricultural section. In addition, a Rural Sub-Committee has been set up to consider the development of scientific home management in agricultural areas. No adequate investigation has yet been made on this subject in this country, although investigations have been carried out in the United States of America and many European countries.

Since agriculture is in most parts of the world the predominant industry, it is probable that this section will secure delegates from a greater number of countries than will the industrial section. The organizers are keeping in close touch with farmers and agricultural organizations throughout the world. It is probable that one of the plenary sessions of the Congress will include discussions of the problems in agricultural management that arise from British marketing schemes.

Visitors from abroad will be afforded special opportunities of visiting British farms and agricultural institutions. Full programmes and membership forms will be available by the end of October and may be obtained after that date from Mr. H. Ward, 21, Tothill Street, London, S.W.1.

National Rat Week, November 5-10, 1934

THE annual "Rat Week" will commence this year on Monday, November 5, and the Ministry desires again to emphasize the importance of concerted action during that week for the destruction of rats and mice. To ensure maximum results it will be necessary to secure the energetic co-operation and support of local authorities and the general public.

It is hoped that all or any of the following suggestions will be adopted as far as practicable, and that any other procedure that may be specially suitable for any particular locality will be employed.

(i) Advertisements might be issued to the local Press and editors requested to insert a prominent notice on the subject.

(ii) Bills might be distributed in public places and through the agency of public libraries.

(iii) The Ministry has in course of preparation an illustrated poster that will shortly be available in two sizes, 15 in. by 10 in. and 30 in. by 20 in., price 3d. and 4d. each, respectively, for single copies, with reduction for quantities: extensive use might be made of this means of publicity.

(iv) Up to 100 copies of Advisory Leaflet No. 49, "Destruction of Rats and Mice," may be obtained by local authorities gratis and post free from the Ministry, and additional quantities may be purchased from His Majesty's Stationery Office at the reduced rate of 2s. per

NOTES FOR THE MONTH

100, postage extra. It is hoped that large quantities of these leaflets will be distributed.

(v) His Majesty's Stationery Office has arranged to supply local authorities with a cheap abridged reprint of the Ministry's Bulletin No. 30, "Rats and How to Exterminate Them," at the rate of 4s. per 100, carriage forward: these might be used freely.

(vi) Arrangements might be made with the proprietors of local cinemas for the exhibition of the Ministry's film on the destruction of rats, as a preparation or sequel to the week's campaign.

(vii) The Ministry's lecture, "The Story of the Rat," illustrated by lantern slides, might be given at local halls.

(viii) Local chemists and hardware dealers might be invited to stock and advertise extra quantities of suitable baits and appliances for destroying rats and mice.

(ix) Special attention should be given to any source of infestation on properties owned by local authorities, e.g., rubbish tips, sewage farms.

(x) Treatment of sewers should be systematically carried out.

It may be added that the Ministry is always prepared to assist and advise in any case presenting features of special difficulty.

Agricultural Wages (Regulation) Act, 1924: Report of Proceedings

THE MINISTRY has recently issued a Report of Proceedings under the Agricultural Wages (Regulation) Act, 1924, for the two years ended September 30, 1933. The Report gives full details of the minimum rates of wages as fixed by the Agricultural Wages Committees for each of the 47 areas into which England and Wales are divided for the purpose, and includes a review of the changes made in the rates during the period concerned. Sections of the Report deal with such matters as the work of the Agricultural Wages Committees in determining applications for Permits of Exemption, the investigations made by the Ministry's Inspectors for the purpose of securing the proper observance of the minimum rates, and the state of employment in agriculture. The report is obtainable through any bookseller or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s. 3d. net, post free 1s. 5d.

THE SHOW STANDARDS OF CATTLE

A. D. BUCHANAN SMITH, M.A., B.Sc.,
Institute of Animal Genetics, University of Edinburgh.

WITHIN recent years, there has been a good deal of discussion concerning the conformation of the dairy cow and its relation to milk production. There has been much dispute concerning the value of show type for commercial purposes. The showyard is being criticized. This has now led to questions concerning the value of our pedigree breeds of dairy cattle and it is stated that the methods employed by British stockbreeders in the past have been fundamentally unsound and that we are at the present day following a will-of-the-wisp policy of live-stock improvement. The culminating criticism is that, in view of either modern requirements or scientific advances, or both, we should scrap our present methods and breeds and start afresh our whole work of dairy cattle improvement.

To the majority of those who are connected with the dairy cattle industry, the final conclusions of these critics, as recently voiced, appear absurd. The present era, however, is one of new methods and viewpoints. However outrageous such criticism may appear, it behoves us to examine it from a double standpoint. Is it sound economically? Is it based on scientific fact?

Scientific Evidence.—Let us first deal with the scientific aspect. Much has been written concerning the inheritance of milk yield. Unfortunately the greater part of this work is based upon mere observation, as distinct from ascertained fact. The scientific investigations on this subject are not numerous, but they are as many as could be expected, considering the rate of reproduction in the cow. The majority have been made in the United States.

From the evidence available the following facts are clear:—

Total yield of milk is largely conditioned by heredity.
Nutrition and environmental factors are important and cannot be neglected.

Total yield of milk is inherited in no simple manner.

THE SHOW STANDARDS OF CATTLE

Quality of the milk is largely inherited, and is to a much lesser extent affected by nutrition and environmental factors.

The amount of fat secreted by a cow is, to a very large extent, inherited independently of the total yield of milk. As regards the other constituents, casein, sugar, hardness of curd, size and shape of the fat globule, and each of the principal minerals (except iodine), there is reason to believe that the same holds good.

All these points are reasonably well proved, and, while nothing is ever certain, they can be taken as the basis for future work. Indeed, if the scientific method is worth anything, these facts must be used as the stepping-off place both for further scientific work and for practical stock improvement.

The inheritance of milk yield has long been recognized by practical stockbreeders to be a problem of great complexity, and it is therefore but natural that the breeder should look to the geneticist for some method whereby the workings of heredity might be accelerated—the more so as the life of the dairy cow is short when compared with the time taken to prove her milking capacity. The average life of a dairy cow is about six years. She is three years old before any general assessment can be made of her productive qualities, and is four years of age before this figure can be obtained with any degree of accuracy. Accordingly, the breeder has evolved a lore concerning the relation of the form of the dairy cow to her productive capacity, a lore that is also applied to the dairy bull. It is this lore that has become the foundation of our showyard system and that is now being so violently attacked.

As far as science is concerned this lore falls into two parts. The first relates to the points that are capable of scientific measurement, and the second to those that have so far defied accurate measurement. Of the measurable points of the dairy cow, certain definite correlations have been found between form and function. With a few exceptions the relationship is so small as to be barely worth further consideration from the practical aspect of stock improvement. Other things being equal, size, as measured by weight, bears a direct correlation to total yield. Thus it is that the progeny of certain bulls show an increased yield principally owing to the fact that their sire transmitted a big body rather than a big yield. Obviously, an Ayrshire cow will

THE SHOW STANDARDS OF CATTLE

give more milk than the larger matron of the Scotch type of Shorthorn. Size is only an accessory factor towards increased production. To a lesser degree, certain measurements such as length, girth, etc., bear a similar relation to total yield of milk.

There is definite scientific evidence that conformation on the whole is no sound criterion of the true milking capacity of a cow. Especially as regards the shape of a heifer there is nothing measurable that can yet be considered to be of the slightest value as an indication of the amount of milk she will give when she calves. Indeed, scientific evidence points to the fact that it is definitely unsound to attempt to prognosticate the yield of a heifer either by measurement or by eye.

The other aspects of form—those that are not amenable to measurement—are probably of some importance, since they relate principally to the organs of milk secretion. One of these that has been scientifically examined, namely, the diameter of the milk wells, shows a definite correlation to productivity. It is, therefore, reasonable to assume that breeders, both past and present, are justified in taking into account the mammary development.

It has been shown, however, that the nature of the escutcheon (the area of skin between the hind legs stretching from the udder to tail head) is no indication of milking capacity. Where a positive correlation has been obtained between the shape of the escutcheon and yield of milk, this may be attributed to the fact that, owing to the escutcheon shape being hereditary, there has been in that particular strain of cattle, a chance association of yield and escutcheon. This fact gives us a clue to one reason why so many breeders have associated form with production, particularly as regards points of conformation of no obvious utilitarian value. A breeder has a high-yielding cow with, let us say, a particular shape of ear. He remembers that the dam of this cow had both these qualities and notices that amongst the daughters of the son of this cow most of the high-yielders have also got ears of this particular shape. He theretore concludes that the ear shape is an indication of production, when the fact is that the association is more or less a chance one. It may, however, be of value to him in the selection of high-yielders of that particular strain. It also may not. If he finds it is, the breeder tells his son of his observation. The son accepts it as gospel and it

THE SHOW STANDARDS OF CATTLE

becomes incorporated in breed type. As generations of cows pass on, the association becomes weaker, but the belief is apt to become greater. This is where so many pedigree breeders have been led astray.

As the outcome of scientific observation it may be accepted that it is unwise to use conformation as a guide for the selection of cows with a high capacity for milk production: but this does not imply that conformation is without value. Unless a cow is capable of producing a minimum quantity of milk she is not a dairy cow no matter that she may belong to a dairy breed. Even if she does produce an adequate quantity of milk, she may still be unsuitable for commercial milk production. An adequate yield of milk as regards both quantity and quality is a prerequisite, but there are other points of equal importance.

Amongst these points are characters that affect the length of life of the cow, and others that affect her economic utilization of food or her powers to breed at regular intervals. If any of these characters can be shown to have any relation to conformation, then the principle of the method on which selection is at present based can be justified.

Take longevity first; it is the cow that produces 10,000 gallons in her lifetime that is more remunerative to her breeder than the cow that can produce 2,000 gallons in one lactation but cannot keep it up. We must recognize that in breeding for high production, we are selecting for a type of mammary apparatus that puts a severe strain upon the other organs of the body. It is as though in the thoroughbred horse we were to select for ability to move at great speed but, at the same time, were to neglect the development of the heart. It is the thoroughbred that can win races throughout a long life that is remunerative to its non-betting owner.

The qualities that make for longevity are various and cannot all be described here. Amongst the most important are the legs and feet. Crooked hind legs, poor pasterns, and soft hooves are causes of serious loss in our dairy herds and are definitely of genetic origin. Because of undesirable hind legs, some high-yielding cows become absolutely worthless. If a cow has the right hind feet and legs, she can stand on concrete for fifteen or twenty years and she can travel to pasture without pain or trouble. It is very easy to get poor legs into a herd and the only way to

THE SHOW STANDARDS OF CATTLE

prevent this defect is to select breeding stock by conformation.

As well as being a possible measure of production, the shape of the udder is important from this point of view. There are good producers with capacious but otherwise badly-shaped udders: such udders are more subject to injury. Each quarter should be evenly developed and the udder should not be pendulous or cut up. The properly-built udder is protected from injury, is not so likely to be stepped upon and is much easier to keep clean. It is usually in the udder that cows show the first sign of unsoundness. Again, with the advent of the milking machine, the correct placing and size of the teats is a matter of great importance.

With regard to the economic utilization of food, it is essential that a dairy cow should have plenty of capacity—both of chest and of digestion. A high producer may occasionally be flat in the rib, but it is seldom that she is an economic producer of milk when examined from the point of view of food consumption.

The saner objections to the show standards have centred around such descriptions as, "a clean cut feminine head with plenty of character and style, plenty of width between the eyes, etc., etc." Whether there is any correlation between these qualities and milking capacity has never been directly scientifically determined. No one will dispute however, that the appearance of the head of a cattle beast gives an indication of sex whether the animal be bull, steer or cow: but this indication is not infallible. There are cows with heads like steers. Likewise there exist effeminate bulls. If, in an animal of either sex the reproductive organs cease to function fully, then, in accordance with the degree to which the sex organs are upset, the appearance of the animal changes in the direction of an intermediate or neuter type, or may even approach the type of the opposite sex. Thus, the appearance of an animal is governed by the functioning of the sexual organs, which also govern both milk secretion and fertility. Hence it is not illogical to assume, as practical breeders have done, that there is a valuable connexion between the head, as an indication of sex and the economic worth of a dairy cow.

To sum up the scientific evidence it may be stated that the existing method of the breeders, based on a correlation of form with function, is not unsound. While conformation

THE SHOW STANDARDS OF CATTLE

of the dairy cow may give small indication of the capacity of the organs of milk secretion, it is of definite value as regards other qualities that are of prime importance from the standpoint of lifetime production.

The Economic Aspect.—Such being the scientific evidence the situation in England may now be examined from her rather peculiar economic standpoint. No other country in an advanced state of agriculture has so many cattle of the dual-purpose type. Some other countries wish they had, while others are content as they are, but that is not the present issue. The dual-purpose animal suits a certain type of farm economy prevalent in England. So far, no measure has been devised—or is likely to be devised in the immediate future—whereby the breeder may assess the value of the carcass of an animal on the hoof other than by the eye. Hence, conformation is fundamental in the selection of animals of the dual-purpose breeds.

“To every action there is an equal and opposite reaction.” It must be admitted that in every breed of live stock there has been a period when the principal breeders set undue store by some character whose economic worth was trifling. That some breeds diverged further than others from the economic path is probably the reason for the present criticism, but does not justify the conclusions at which the critics are arriving.

Our pedigree system is not at fault. Like other British institutions it requires some adjustment, especially at a time of economic stress such as the present. The same holds good as regards the show-ring. Yet let it be recognized that it is the pedigree system and the show-ring, together with the native wit of the stock raisers of England—and more latterly of Scotland—that have given the breeds evolved in these Islands, including the Channel Islands—the predominant position they now occupy in the agriculture of the world. There is only one breed of cattle of world-wide reputation that has not originated in the British Isles. For the future, as science devises measures of production and as it discovers more exactly the manner in which specific characters are inherited, so must these be incorporated into our methods of stock improvement and be grafted on to the art of breeding, just as we are now witnessing the incorporation of milk recording into the old methods of pedigree breeding and its grafting on to the ancient prin-

THE SHOW STANDARDS OF CATTLE

ciple of the progeny test, so much used by the early breeders and for which the foundation is pedigree.

It is perhaps the show-ring that most requires adjustment to modern conditions. As Professor Scott Watson has said, the art of "bringing out" stock has made more progress than the art of breeding. More emphasis requires to be laid upon definite evidence of milking capacity before a cow can be entitled to the prefix "dairy." There should be more place given to tests of families, daughters of one sire, etc. Also there should be a class for cows that have given over 10,000 gallons and for which every entry forward should receive a prize. When Shows were first started the educational aspect was first and foremost in the live-stock exhibits. Our show societies have not forgotten this, as witness the incorporation in their programmes of young farmers' judging competitions, etc.: but they can advance still further.

Against the present system it is argued that the live stock of to-day are no better than the stock of a century and a-half ago. That is not true. Undoubtedly there were at that period some high-producing cows, even after making allowance for the fact that milk was not weighed but measured by volume, as delivered from the cow, complete with froth, and that it is difficult to determine whether the pints and quarts were Imperial or local. The point is that proportionately there were not so many high-producing cows as there are nowadays. Moreover, the average production of the dairy cow was not so high as it is at present. It is true that there are no figures to show the yield of the cow of 150 years ago: but there is no question that the yield has definitely improved during the past thirty years. Take only the figures of the officially milk-recorded cows. Annually these show a small but usually consistent increase. Since 1918, despite the fact that the number of recorded cows and heifers has been increased sevenfold, their average annual yield has gone up from 600 gallons to 700 gallons, i.e., an increase of nearly 17 per cent. It may be argued that this is due to better methods of nutrition. That is in part the truth: but within the past few years, the dairy farmer has had little incentive to feed for maximum production and to force his cows to the utmost. In addition, improvements in methods of nutrition can only be effective if the cows have the inherent capacity to respond to the increased feeding.

THE SHOW STANDARDS OF CATTLE

Here are recent figures of cows officially recorded in England, classified by breed, showing the numbers and the average yields of cows for the years ending October 1, 1929 and 1933 respectively. In studying the figures of the latter year it must be remembered that the price the farmer obtained for his milk was appreciably less than in the earlier year. The Index figure for milk for the year ending October 1, 1929, was 170, while that for the year ending October 1, 1933, was only 150.

Breed	1928-1929		1932-1933	
	Number of Cows	Average Yield.	Number of Cows	Average Yield
		<i>lb</i>		<i>lb</i>
Ayrshire	1,430	7,334	2,172	7,236
Friesian	12,170	8,383	12,886	8,828
Guernsey	3,702	6,344	5,341	6,453
Jersey	2,512	6,250	3,123	6,307
Lincoln Red	1,561	7,123	1,085	7,248
Red Poll	3,000	7,017	3,723	7,176
Shorthorn	45,391	6,986	41,670	6,989
South Devon	1,000	6,747	1,076	6,420

It is also argued that since this annual improvement is so small we ought to scrap existing methods of improvement. Apart from the fact that such critics are unable to put anything in place of that which they decry, it can be questioned whether the rate of improvement is slow.

Looking at the question from a genetic aspect, the point is complicated. The speed at which the genetic improvement of any species takes place *should be measured in generations, not years*, and in relation to the number of genetic factors that affect the characteristic in question.

If it is desired to fix a breed whose only desirable qualifications are the absence of horns, a black skin and a white face, it would take at least six generations before these three qualities would be even approximately fixed, and even then off types would be produced in comparatively large numbers.

Milk yield is inherited in a far more complicated manner than is coat colour. If, after six generations of intelligent selection for coat colour, we are still apt to get off types, so shall we be apt to get, for a much longer period, cows of low milk production that must be culled from our herds. *The science of genetics offers no short cut towards the*

THE SHOW STANDARDS OF CATTLE

improvement of our live stock. It justifies the methods of our master breeders, points to practices and beliefs that should be discarded, and by emphasis on the association of certain characters in their inheritance can certainly hasten the improvement of our stock. It cannot, however, substitute a quack medicine for the hard work and shrewd judgment that have characterized our master breeders of the past, and that will be as much required of their descendants in the future.

The science of genetics has already served a useful purpose in that our knowledge is being placed on a logical basis, whereby each new generation of breeders does not have to master the art from the beginning, but can make a start where its forerunners have ceased. As science codifies the laws of the inheritance of milk yield, so does it definitely assist the improvement of our average stock.

ALTERNATIVE SYSTEMS OF HEATING GLASSHOUSES

H. V. TAYLOR, O.B.E., B.Sc., A.R.C.Sc.,
Horticulture Commissioner, Ministry of Agriculture and Fisheries.

HEATING is an expensive item in the production of glass-house crops, constituting one of the main overhead charges of an industry in which costings have to be very closely considered. The hot-water system, the first to be adopted for this purpose, is still the most commonly employed, although it has several drawbacks. The plant required is bulky and costly to instal; the expenses of running and up-keep are considerable; and, although many improvements have been effected in the design of boilers, etc., the thermal efficiency obtained is still very low. The system, moreover, does not lend itself to automatic control, so that constant attention is necessary to maintain the desired even temperature in the houses; and the arrangement and disposition of the houses is largely dictated by necessary proximity of the boiler, to avoid loss of heat in transmission, rather than by considerations of general convenience. Nevertheless, the hot-water system still holds the field on economic grounds, although increasing attention has been given, in recent years, to other systems that give promise of possible economy and greater flexibility in arrangement and working; and a brief summary of the various methods may, therefore, be of interest.

Heating by Hot-water.—Perhaps the chief advantage of this, the present standard method, is that it is an individual one, each grower installing the necessary plant for heating his own glasshouses, and having it, therefore, under his entire control. Accurate costings are difficult to obtain, but, for the Lea Valley, the cost of a heating plant (boilers and pipes) for 1 acre of glasshouses is said to be nearly £1,000. An acre of glass will be represented, approximately, by 16 houses (each 100 ft. long by 27 ft. wide and 9 ft. high), and, to heat this range, a large boiler, or several boilers (4 is a common number) will be required, connected with a series of 4-in. pipes carried round each house on a flow and return circuit. The length of piping between the

ALTERNATIVE SYSTEMS OF HEATING GLASSHOUSES

boiler and the houses must, naturally, be kept as short as possible to avoid loss of heat in transmission, and such piping will usually need a protective insulating covering.

The boilers are normally designed to give a water temperature of 150° F. in the flow pipe, and this temperature, by radiation of the heat to the air of the house, rapidly falls to one of 130° F. in the return pipe. The difference between the indoor and outdoor temperatures will, however, largely determine the amount of fuel consumption. To maintain a temperature of 70° F., in the large glasshouses used for tomato growing, when it is 40° F. or less outside, means a rapid loss of heat, and the fires will need to be driven. Conversely, when the desired indoor temperature and that out of doors approximate fairly closely, the flues can be closed and the fires banked.

Fuel Requirements.—Apart from the special circumstances of very cold weather, the amount of heat required varies from day to day, month to month and year to year. The grower of early tomatoes, for example, will generally use more fuel than the grower of late tomatoes; the former may need as much as 220 tons of coal per acre of glass during the year, while the latter will find 150 tons or less sufficient. Only small quantities of fuel will be required for heating the propagating houses in December and January, but in February, when the plants are set out in the houses, firing proper begins, and is continuous for the rest of the growing year.

The variation in fuel consumption may be illustrated by the following figures, those of one nursery with reasonably good houses and an efficient boiler plant, the grower using 180 tons, approximately, of anthracite (14,000 B.Th.U.) during the year.

		Tons.			Tons
December	..	3	June		12
January	..	3	July	..	10
February	..	30	August	.	10
March	..	30	September	..	12
April	..	23	October	..	14
May	..	18	November	..	15

As to the fuel used, boiler furnaces can be adapted for burning coal slack, anthracite, coke, wood, or even peat; and selection of a fuel depends mainly on cost and, possibly, convenience in obtaining supplies. Coal slack is popular in the Channel Islands, anthracite in the Lea Valley and coke in the north of England, although, in each instance, the

ALTERNATIVE SYSTEMS OF HEATING GLASSHOUSES

governing factor is cost delivered to the nursery, and this naturally varies with the district.

Oil Fuel.—Boiler furnaces, in some instances, have been fitted with special burners for burning fuel oil instead of coal or coke. The oil burners give a steady flame and do not require much attention; and oil heating can, moreover, be regulated by thermostatic control, facilitating the maintenance of a more even temperature in the houses. The oil is fed from tanks, which are periodically replenished by the oil suppliers, so that there may be some small saving over the handling of the more ordinary fuels. Yet, while these advantages are admitted by growers who have tried oil firing, they do not seem, on the year's working, to have been able to effect any economy by it; and in some instances, the use of oil appears to have increased the cost.

Fuel Cost per lb. of Produce.—The important consideration is what proportion the fuel bill bears to the selling price of the produce. In the Lea Valley, the annual fuel bill (assuming anthracite is used) for heating an acre of glasshouses will probably amount to £360. The selling price of tomatoes, taking an average throughout the year, will be about £40 per ton, and one acre of land under glass should produce some 40 tons of saleable tomatoes. The gross return from 1 acre would, therefore, be 40 times £40 or £1,600, of which the £360 spent on fuel represents approximately 22 per cent. This means that nearly 1d. of the selling value per lb. is expended on fuel for heating. The high proportion of fuel cost to be deducted from the selling value of every lb. of tomatoes is one of the trials of growers, who naturally attempt to lessen it.

Heating by hot-water is a home-production system. The grower instals his own plant, buys his own fuel and stokes his own fires to maintain such temperature in his glasshouses as the production policy of his nursery requires. Until recent years, no other method of obtaining heat had been tried or, possibly, been thought of by many growers. Methods now to be described introduce a new principle, that of buying heat "ready made," as it were; and it need hardly be added that a heating system that is satisfactory from the point of running expense, and from which the cost and labour of heat production is eliminated, should go far to remove one of the principal existing difficulties of glass-house production.

ALTERNATIVE SYSTEMS OF HEATING GLASSHOUSES

Electrical Heating.—For this form of heating, current would be purchased from an electrical power supply company. It is by far the most attractive alternative to the hot-water system. Growers in other countries have tried heating both the air and the soil in glasshouses by electrical means, and an account of methods of soil heating in this manner was published in the February (1934) issue of this JOURNAL. The electrical heating of glasshouses presents no engineering difficulties; cables suitable for heating both soil and air can be obtained, and a steady temperature can be maintained, as thermostatic control of electrical heat is particularly easy and reliable. Electrical heating has also been studied in this country since the large electric power stations came into existence; and some of the power supply authorities have been very ready to assist in experiments.

Enthusiasts have conjured up visions of a future when the tomato grower will sit in his office, surrounded by dials and controls, and be able, by a turn of a switch, to energize the circuits in the houses to warm the soil or air, or both, and, conversely, with equal ease, to lower temperature at will. He will be able to equip his houses with special artificial sunray lamps for use on the grey days when natural sunlight is lacking. Dials would be plotted to record the continuous temperature of each house, and the carbon dioxide and water contents of its atmosphere. Truly a happy vision for all skilled tomato growers, especially for those with a scientific bent!

Unfortunately for this dream, the fact remains that, at present, heating by electric current is generally more expensive than the older hot-water system based on the home production of heat from coal. If the price of current could be reduced to $\frac{1}{2}d.$ per unit or less, there is little doubt that electrical heating would be more generally adopted.

Tomato production is a highly-skilled business in which every operation has a scientific basis. The soils, blend of manures, and even the amounts of water used, are all matters for control; and if the temperature and light could be maintained at the optimum, earlier and better crops would be assured. It is not possible to do this by the hot-water heating system, and its method of production lacks precision. Through the medium of electricity, it is easy to see how perfect control could be obtained, but its adoption, generally, must depend on a low price for current.

ALTERNATIVE SYSTEMS OF HEATING GLASSHOUSES

Purchased Steam.—Heat in the form of steam purchased from a power plant in the vicinity of a nursery has been visualized as another method of heating glasshouses. One power station in this country, in addition to producing electric current, supplies steam ("bled" from the turbines) to heat buildings near at hand. There are, however, few "bleeder" turbines installed in Great Britain, and as existing turbines cannot be adapted for "bleeding" purposes, there is little possibility of developing such a system of supply. One or two power stations, however, sell steam to factories, in their neighbourhoods, for process use.

It is doubtful whether the existing powers of many electricity undertakings in this country would permit them to embark on the enterprise of selling steam, although this disability could, no doubt, be rectified where a company wished to develop such a business and were assured of a continuous demand for steam.

The smaller private electric and gas plants are gradually being superseded by large public undertakings, and it may prove more economical in the future, therefore, to buy steam for heating than to produce heat at home. The small heating plants now to be found on every nursery may be efficient for their purpose, but it is not unwarrantable to assume that they are not able to produce heat as economically as a large public power plant. It is not a matter, however, on which one can be dogmatic; until the power plant supply has been tried for glasshouse heating—and this has not yet been done in this country—no one can say for certain which is the cheaper method.

Condenser Waste Water.—Large quantities of cold water are used for the condenser plants at power stations, and this water, which becomes heated in the condensers, is then discharged into streams, or passed into cooling ponds, the station engineer having no use for the water in its heated condition. Here, then, is heat going to waste, and remembering the number of power stations in the country, the aggregate waste of heat must be prodigious. Many brains have worked on the problem of harnessing this waste heat for the service of the glasshouse industry. If a method could be devised, it would mean an increase of value from the coal consumed by effecting an economy in the production of both electric power and tomatoes.

Although the waste water has been applied in this country for warming offices and other buildings, its temperature in

ALTERNATIVE SYSTEMS OF HEATING GLASSHOUSES

cold weather is only about 60° F., and it is of little value, therefore, for heating glasshouses that require a water temperature of 140° F. to 150° F. The only possibility of its use in this direction would seem to be as a feed supply for the boilers of ordinary hot-water plants. Being already partially heated, its use in this manner should make for economy in time and fuel consumption.

Although, as discharged from the condensers, this waste water is not sufficiently hot for glasshouse heating, there would seem to be possibilities of employing it for soil heating where early vegetable crops are desired; and some particulars of such use in Germany are given in a note at the end of this article.

German Experience with Purchased Heat Supplies.—In Germany, some attempts have been made by electricity power companies to demonstrate the advantages to be gained by building glasshouses in the vicinity of power stations, so that the latter can supply steam for heating and current for lighting purposes. Three such demonstrations have been made, one at the Wiesmoor Power Station associated with the Nordwest deutsche Kraftwerke A.G., a second at the Bleicherode Station of the Überlandzentrale Sudhans G.m.b.H., and the third at the Klingenberg Power Station of the Berliner Stadtische Electrizitätswerke A.G.

Some particulars of the experiments at Weismoor and Klingenberg are available, including the size of the glasshouse areas, the crops grown and the amounts of steam required. No information has been obtained by which the cost of heating the houses by this method could be compared with the cost of heating by other methods.

At Weismoor, there are about 375,000 sq. ft. of glass-covered surface, the houses being supplied with the required heat in the shape of steam "bled" from the turbines of this power station, where peat fuel is used. This Station, too, shows a further step in relating the hothouse to the power plant by the supply to the glasshouses of carbonic acid in the form of purified waste combustion gases. These gases, on emergence from the furnaces, are passed through the preheaters to raise the temperature of the boiler feed-water, and afterwards passed out up the chimney. They are now being drawn from the chimney uptake through a gas-cleansing plant, whence a fan forces them through an underground pipe to the hothouses, a distance of about 1,150 ft. There the gases are uniformly distributed, by

ALTERNATIVE SYSTEMS OF HEATING GLASSHOUSES

means of pipes pierced with openings at regular intervals, throughout the houses, which are 450 ft. long. Experience has shown that the application of this extra carbonic acid to the cultures for one hour each forenoon and each afternoon is sufficient. The installation has worked since 1929.

The glasshouses erected at Klingenberg, in 1928-29, comprise hothouses for raising cucumbers and tomatoes, with a house for flowers as an adjunct. At present they cover about 108,000 sq. ft. of cultivated area, while available reserve space will permit an extension of about 54,000 sq. ft. The housing is divided as follows:—

	<i>Approximate total area. sq. ft.</i>
12 cucumber houses, each 264 ft long, 13 ft. wide and 8½ ft. high	49,500
1 nursery for cucumbers and tomatoes, of similar dimensions to those above	
1 connecting building, 215 ft. long, 26½ ft. wide and 13 ft. high	5,900
1 flower house, 254 ft. long, 20 ft. wide and 10 ft. high ..	5,600
7 tomato houses, each 220 ft. long, 30 ft. wide and 13 ft. high	48,000
	109,000

The houses, all of mixed wood and steel construction, are ranged, at right angles, on either side of a central walk.

Steam, "bled" from the turbines, is used for the heating. The steam, at a pressure of 35 lb. per sq. in., is conducted through counterflow coils in which it heats the circulating water of a hot-water pumping system. To maintain the proper temperature, taking a maximum of 160,000 sq. ft. of cultivated beds in the cucumber and tomato houses, and a lowest outside temperature of minus 20° C. (minus 4° F.), about 9 tons of steam per hour are required. Unlike ordinary hothouse-heating systems, where the firing requires constant attention, the system at the Klingenberg glasshouses needs little attendance, the required quantity of steam being always "on tap" from the power house. This arrangement is of particular advantage in the transition periods between seasons, and on cold summer days when a sudden drop in temperature necessitates additional heating. Mention must be made, too, of the soil-heating system provided here, ensuring a favourable growing temperature even during the winter months.

Experiments in subjecting growing plants to the influence

ALTERNATIVE SYSTEMS OF HEATING GLASSHOUSES

of electric light have also been successful. The current required for this purpose, together with that needed for a contemplated electrical soil-heating system, promises a substantial increase in power consumption.

German Experiments in Condenser Water Utilization.—

At the Weismoor Power Station, experiments have been conducted for utilizing the waste condenser water. The winter temperature of this water ranges from 15° to 20° C., (59° – 68° F.) and, in the spring and summer, the temperature is about 35° C. (95° F.). Up to the present, this water has been used as follows:—

(1) In a strawberry plantation, about 12,000 sq. m. (roughly 3 acres) in extent. This is traversed by 8 trenches, about 11 m. (say 36 ft.) apart and 75 cm. (2 ft. 6 in.) deep, the principal trench being 3 m. (about 10 ft.), and the others 1 m. (3 ft. 3 in.) broad. 45 cub. m. (about 10,000 gal.) of the warm condenser water are passed along each trench per hour. On cold winter nights, the vapour rising from the warm water produces a thick mist over the whole field, effectively protecting the strawberry flowers from frost; and these water canals also have the advantage of providing some part of the large quantity of water needed by the plants.

(2) On an experimental asparagus field, in the neighbourhood of the cooling towers, with an area of about 1,600 sq. m. (or, roughly, $\frac{1}{2}$ acre). This field is traversed by galvanized iron pipes, 6 to 10 cm. (3 in. to 4 in.) in diameter, which are buried 65 to 75 cm. (2 ft. to 2 ft. 6 in.) below the surface, some beneath, and some close by, the asparagus beds, in which the crowns of the asparagus plants lie about 70 cm. (2 ft. 3 in.) below the surface of the soil. Half the field was piped, the condenser water circulating through the pipe system, and the other half left unpiped as a control. The temperature of the warmed soil, taken at a depth of 10 cm. (approx. 4 in.) three times a day, showed it to be from 4° to 8° C. higher than that of the unwarmed portion. The first shoots showed through in the heated soil on April 10, whereas they did not appear in the unheated beds until May 7.

(3) In tomato houses, the warm condenser water was circulated in subsoil pipes laid 35 cm. (about 14 in.) below the surface of the beds, and 1.25 m. (4 ft.) apart. The condenser water was turned into the pipe system shortly before planting out in January, at which time the soil temperature in the houses is usually from 10° to 12° C. (50° to 54° F.). It was found that, after about six days, the soil temperature had been raised about 3° C.

By such experiments, the Germans are discovering what advantage can be derived by linking together two young industries that are, at present, being developed in their country. The British glasshouse industry is much larger and older, and, being fairly established on settled lines, will not be so easily linked up with power stations. Someone, however, must take the lead in such a development, and little progress can be expected until the electric supply undertakings have shown by experiment that, by such a combination of the two industries, the much-needed economy in glasshouse heating may be secured.

REPORT ON THE WORK OF THE EDUCATION AND RESEARCH DIVISION OF THE MINISTRY FOR THE YEAR 1932-33

I.—AGRICULTURAL RESEARCH (INCLUDING LOCAL INVESTIGATION AND ADVISORY WORK)

Agricultural Research.—The Ministry's activities in connexion with agricultural research are related to the administration of a series of grants, summarized in Table I (p. 653). It may be convenient to refer briefly to the items of expenditure shown in that table, in order to explain the various branches of activity and the general purpose of the scheme that underlies them. After this general statement, brief notes will be given of the position of the individual grant-aided groups during the year under review.

Turning to the table, it will be noticed that four items relate to expenditure having an obviously Imperial bearing. Grants aggregating £19,150 were paid in respect of Imperial agricultural schemes at research institutes. These grants were authorized by the Empire Marketing Board, and were paid through the Ministry as the Department charged with the administration of the schemes. (It may be noted here that the Empire Marketing Board passed out of existence on September 30, 1933, so that in subsequent years these schemes, in so far as they may be continued, will be aided from a different source.) The remaining three items of expenditure of an imperial nature are the Government's contributions to the Imperial Agricultural Bureaux, the Imperial Institute of Entomology and the Imperial Mycological Institute. Here again the financial year 1933 is the last for which these items will appear in the report of the Research Branch, as it has been decided that in future the expenditure shall be borne on the Vote of the Dominions Office.

Then follows an item of £17,000, which represents the expenditure authorized in 1933 for the investigation of Foot-and-Mouth Disease under the supervision of the Foot-and-Mouth Disease Research Committee. The main centre for this research is the Foot-and-Mouth Disease Research Station at Pirbright, Surrey, which is administered from the Ministry's Animal Pathology Laboratory at Weybridge.

EDUCATION AND RESEARCH REPORT.—I

Another separate item relates to the scheme for the testing of agricultural machinery. Further reference is made to these activities elsewhere in this report. The testing of seeds and potatoes, for which £4,715 was provided in 1933, is carried out at the Official Seed Testing Station at Cambridge and at the Potato Testing Station at Ormskirk; both these Stations are administered by the National Institute of Agricultural Botany.

The remaining items of expenditure relate to what may be termed the research and advisory fields proper. The maintenance grants to research institutes, with grants for certain specific schemes of research, amounted in 1933 to nearly £158,000: in addition grants for capital expenditure totalled £4,300. The maintenance grants to advisory centres amounted to £71,000, to which must be added the item of £2,050 paid to the Cambridge School of Agriculture for the farm management survey conducted by the Economics Advisory Branch of the School. The two groups of grants aggregating respectively £1,110 and £2,515 cover special investigations that are needed from time to time, and for which the ordinary resources of the research institute or advisory centre cannot provide. Finally, there is the scheme of research scholarships, fellowships, etc., by means of which recruits to the research and advisory services are secured, and which also provides grants to enable workers to attend conferences abroad or to visit overseas countries for some special purpose connected with their research. The total provision for this purpose in 1933 was £3,145.

Summing up, the aggregate of the grants made for agricultural research and advisory work in 1933 was approximately £288,000. With the exception of the expenditure met by the Empire Marketing Board, namely, £19,150, almost the whole of this expenditure came from the Development Fund.

It may be of interest to say a few words on the methods by which these various grants are administered and the steps taken to secure co-ordination and cohesion among the various branches of agricultural research. First on the point of administration. As stated above, by far the larger proportion of the expenditure comes from the Development Fund, and the Development Commission is the body required by statute to make recommendations to the Treasury for the expenditure of moneys provided by that

EDUCATION AND RESEARCH REPORT.—I

Fund. Grants are accordingly awarded after application has been made to the Treasury by the Ministry, and on the recommendation of the Development Commission. The Agricultural Research Council, which is constitutionally a body established by the Agricultural Research Committee of the Privy Council, and which reports to that Committee, is charged with the responsibility of surveying and criticising, primarily from a scientific point of view, the work of research centres and other institutions where agricultural research is conducted; it is the advisory body to the Ministry and to the Development Commission over the whole field of agricultural research. Briefly, therefore, the Ministry is responsible for administering the grants made for agricultural research, as for advisory work; it seeks advice and criticism from the Agricultural Research Council, and with this advice at its disposal makes application to the Treasury for authority to make grants from the Development Fund, subject to the recommendations of the Development Commission.

To make the picture complete, it should be added that the Agricultural Research Council has a certain limited fund at its own disposal from which it may make grants for agricultural research, in consultation with the Ministry. These grants supersede the scheme of Special Research Grants that have been made in the past by the Ministry in conjunction with the Development Commissioners.

The agricultural research and advisory system centres round the main research institutes, which are in receipt of "block" annual maintenance grants from the Ministry. The principle of the "block" grant is that any "savings" on the year's grant accrue to the institution, which in ordinary times may thus be able to set aside a reserve against a future need for specially heavy outlay arising from the carrying out of its research programme. Since 1931, however, the financial position has required the limitation of grants to immediate requirements; and such surpluses as had been accumulated have, speaking generally, become exhausted.

A list of the grants to research institutes paid in respect of the academic year 1932-33, with comparative figures for the previous year, is given in Table II. The general basis of assessment was that no extension of work could be permitted if it involved increased grants from State sources, and the salary cuts imposed in October, 1931, were con-

EDUCATION AND RESEARCH REPORT.—I

tinued. Fluctuations in the figures as between the two years are due to special circumstances; for example, the reduced grant to the Cambridge Horticultural Station arose from unforeseen delay in the development of the station's programme.

The prohibition of new expenditure of a capital nature, imposed in 1931, was also continued. Capital grants amounting to £4,300 are shown in Table I, but these were in respect of previous commitments, and included the payment of a further instalment (£4,000) of the grant of £50,000 towards the Rockefeller Foundation scheme of the University of Cambridge, to which reference has been made in previous reports. The balance of £300 provided for a portion of the grant-in-aid sanctioned for the erection of buildings, etc., on the Cambridge Horticultural Research Station, this grant being matched by contributions collected from the industry by the National Farmers' Union.

While the Ministry is responsible, in consultation with the Agricultural Research Council and the Development Commission, for the financial provision necessary for the maintenance and development of the normal programmes of research at the various institutions, special needs justifying the allocation of additional State funds may now (as indicated above) be met by the Agricultural Research Council, as far as its resources allow. This fact should be noted here, to remove the impression that the continued limitation of grants since the economy restrictions of 1931 has entirely prevented the development of promising investigations. After surveying the field generally the Council, in collaboration with the Ministry, has in fact been able to provide for some expansion of research in certain directions, particularly animal diseases.

The grants listed in Tables III, IV, and V are all "deficiency" grants, as distinct from "block" grants; that is, they meet the actual expenditure incurred, subject to the approved maximum. The distinction between the investigations detailed in Tables III and IV is that in the former the work is of a continuing kind and the grants normally go on for a series of years, whereas in the latter the investigations are directed towards the solution of special *ad hoc* problems, and usually terminate in a relatively short time. The grants referred to in Table V are in respect of investigations of a more practical nature, frequently initiated by the Ministry to deal with problems arising in the course

EDUCATION AND RESEARCH REPORT.—I

of administration; the fund from which these grants are made is provided so that the Ministry may be able to meet the cost of experimental work carried out at its request outside the normal scope of the research scheme.

Reverting to the individual grants in these three tables, a few points arising during the year under review may be noted. From the footnote to Table III it will be seen that as from March 31, 1933, the grants made in respect of crop variety trials carried out at various centres are merged in the block grant to the National Institute of Agricultural Botany. This change in procedure was brought about mainly for the sake of administrative convenience; the trials have always been conducted under the supervision of the Institute. In regard to the grants for pig husbandry that are made to the Harper Adams and Wye Colleges for investigating problems of pig feeding and management and related matters, it may be mentioned that a measure of co-ordination of this work with somewhat similar investigations carried out in Scotland and Northern Ireland is secured through a committee of the principal workers concerned; this committee meets at intervals to discuss points of common interest. The scheme for testing fruit trees, which has been conducted by the Royal Horticultural Society since 1922 with the Society's Gardens at Wisley as the main centre, was reviewed at the end of 1932 by a small Committee consisting of nominees of the Society and of the national organizations representing the various sections of the industry, growers, nurserymen and canners, under the Chairmanship of Sir A. W. Hill, F.R.S., Director of Kew Gardens. The Committee was unanimous in its opinion that the scheme should be continued, but recommended that the industry should in future contribute towards the cost, hitherto shared by the Society and the State. The effect of this recommendation appears in the reduced grant of £485 for the following year (1933-4).

Little need be said regarding the special research grants set out in Table IV, except to repeat that this scheme, under which assistance has been provided for special pieces of work which research institutes, etc., could not be expected to undertake from their ordinary grants, has now been superseded through the establishment of the Agricultural Research Council. The Ministry is responsible for providing for the continuance of the schemes already in existence when the Council was set up, until they can be

EDUCATION AND RESEARCH REPORT.—I

terminated, and Table IV shows the grants coming within this category.

The experimental work referred to in Table V, in so far as developments occurred during the year under review, is dealt with in a subsequent section, in which the progress of various experimental schemes administered by the Ministry is described.

It may seem curious that in this brief review of the various branches of the research organization, no reference is made to what may reasonably be considered by far the most important part of the subject, viz., the work conducted with the taxpayer's money, and its results. The reason is that in such a report as the present it would be impossible to summarize fairly the large mass of work done during a year; and therefore the Ministry publishes annually a separate volume containing the progress reports of the Research Institutes and other recipients of grants (entitled "Reports on the work of Agricultural Research Institutes and of certain other agricultural investigations in the United Kingdom" *), in which particulars are given of the lines of investigation undertaken and the contributions made to knowledge by research workers throughout the country during the previous year. This publication also includes an account of investigations carried out by the Advisory Officers, under the scheme mentioned below.

Local Investigation and Advisory Work.—It is sometimes suggested that the value of agricultural research is limited by the lack of adequate means of getting the results to the eye and mind of the farmer. It is questionable whether this criticism has any real foundation in fact. All research in progress can be divided roughly into fundamental work of a somewhat abstruse character on the one hand, and investigations having a definitely practical bearing on the other. As to the former, the results are usually published in technical journals, and are discussed among the workers themselves, and others interested, at meetings and conferences, for which ample provision is made. Regarding the latter, filtration through educational advisory channels and through the system of local field trials that permeates the country is necessary before results

* Copies of this volume may be obtained through H.M. Stationery Office. The latest volume, dealing with the work of the year 1931-32, was issued in 1933, price 6s. net. A subsequent volume relating to 1932-33 is in the press.

EDUCATION AND RESEARCH REPORT.—I

are handed to the farmer as undoubted improvements on existing methods. The filtration system is extensive. Research workers, advisory officers and agricultural specialists on the county staffs, whose business it is to deal with the farmers' problems, have numerous opportunities for consultation and mutual discussion. Co-ordinated experimental work is frequently organized with its nucleus either at a research institute or at a provincial advisory centre, and on occasions at the Ministry. When the stage is reached at which the results of research, having gone through the severe test of technical criticism from workers in different areas and of field trials in various localities, can be safely commended to the grower, there are many channels through which the information can flow to him. Research institutes, provincial colleges, farm institutes and county education headquarters all have their publications, which are usually placed at the farmer's disposal either free or at a nominal charge. The agricultural and horticultural press rarely publish an issue which does not contain articles by scientific investigators giving practical information based on the latest knowledge. The Ministry also, through its advisory leaflets and bulletins and its monthly JOURNAL, plays an important part in the dissemination among agriculturists of modern knowledge that, *inter alia*, incorporates the tested findings of the research institutes and advisory centres.

The advisory officers—speaking of them as a system rather than as individuals—play a two-fold part in the scheme of education and research. They link up on the one side with the research institutes, and on the other with the county educational service. Their main responsibility is to the group of counties which forms their province, and in this area to study, as opportunity offers, difficult problems having a distinct local application; to keep in touch with research institutes that may be investigating similar or related problems; and in this way to place at the disposal of the county staffs knowledge on which the latter could not otherwise lay his hands so quickly and easily. In the special case of the veterinary advisers, who are concerned with the field of animal disease, the position of the veterinary practitioner is obviously important: from one point of view the advisers may properly be regarded as a link between fundamental research and the practitioner whose daily work necessarily leaves him little time for systematic investigation.

EDUCATION AND RESEARCH REPORT.—I

The total number of advisory officers now at work is 73, attached to 13 advisory centres. The grants made to the different centres are shown in Table VII. The categories in which advisers are appointed are chemistry (chiefly soils and manures), entomology (insect pests and diseases), mycology (fungus pests and diseases), veterinary science and agricultural economics. In addition, dairy bacteriological assistants have been appointed at nearly all centres as a part of the general advisory scheme.

The grants for 1932-33 were maintained at the level of the previous year, subject to increases due to increments of salary, etc. A few of the main points arising out of the advisory work during the year are mentioned below.

Chemistry.—The reports of the advisory chemists indicate a general increase in the demands made on their services, particularly from the poultry industry. Analyses have been made and advice given upon samples of soils, foodstuffs (both purchased and home-grown), milk, manures and water; the abnormally dry summer was responsible for a great increase in the number of water samples submitted. Surveys of the soils were continued in several provinces, particular attention being paid in the southern areas to problems arising in connexion with horticultural crops. Among other matters that have engaged attention may be mentioned fodder and grass-land problems, questions of tainted milk arising from the feeding of beet pulp, the destruction of mites in cheese, the composition and manurial use of sewage sludge, and the use of alfalfa meal in milk production.

Entomology and Mycology.—The advisory entomologists and mycologists deal primarily with the control of insect and fungus pests and diseases of plants, and undertake local investigations into control measures. They keep in close touch with the Ministry's Plant Pathological Laboratory, to which they send monthly and annual reports on the incidence of pests and diseases in their areas. During this year the service suffered a heavy loss in the death of Mr. T. H. Taylor, the advisory entomologist at Leeds, and temporary arrangements had to be made for the conduct of the advisory work at that centre. One of the outstanding features of the year was the interesting effect of the prolonged drought and its attendant high temperatures on the incidence and intensity of plant pests. Generally speaking, the intensity of plant pests was below normal, but certain

EDUCATION AND RESEARCH REPORT.—I

pests usually considered insignificant, assumed an unusual importance.

Economics.—There is a growing demand for local advice on questions of farm accounts, farm management, and agricultural economics in general. Not infrequently, the problems that arise in the sphere of agricultural economics are of national rather than local importance, and such problems are, where convenient, investigated by means of "co-ordinated" surveys in collaboration with the Institute for Research in Agricultural Economics, Oxford. A typical example is the inquiry into methods of management for milk production, by which the advisers are seeking, in co-operation with farmers in their respective provinces, to arrive at more economical methods of feeding and management. At the Newcastle, Bristol, and Harper Adams centres, the advisers continued their survey of the poultry industry. This survey is concerned with commercial egg-producing enterprises; it has led to the accumulation of valuable data relating to the finances of commercial egg farming.

Veterinary Science.—The work of the advisers covers a very wide range, including particularly the study of epizootic outbreaks and obscure diseases: diseases of sheep and, above all, of poultry receive much attention. The great and growing importance of the poultry industry, and the small amount of knowledge available concerning some serious poultry diseases, make it urgently necessary to do whatever can be done in this direction.

Dairy Bacteriology.—The efforts of this service are mainly intended to secure improvement in the hygienic standards of milk and milk products. A few clean milk competitions have been held: but they are becoming less necessary as the numbers of accredited milk producers increase in the County schemes pending the introduction of an "accredited producers" register by the Milk Marketing Board. Apart from the question of producing milk of low bacterial content, attention has been given to such problems as the keeping quality of milk, ropiness, taints, and the use and care of milking machines. The very dry summer was responsible for a large increase in the number of cases of ropy milk reported.

Miscellaneous Experimental and Research Work.—*Research into Foot-and-Mouth Disease.*—In the early part

EDUCATION AND RESEARCH REPORT.—I

of the period covered by this report the Foot-and-Mouth Disease Research Committee decided that the work had reached a stage when it was necessary to undertake a programme of immunity experiments involving, in an increasing degree, the use of large animals, and consequently greater expenditure. Before committing itself to such a programme, the Ministry specially invited the Agricultural Research Council to investigate and advise. The report presented by the Council testified to the value of the research conducted by the Committee, and to the need for immunity experiments with large animals on the lines proposed; it also assumed the continuance of research on a long-term basis. The Ministry accepted the Council's report: and in order to provide proper facilities for carrying out the programme, and also to ensure the effective isolation of the Pirbright Experimental Station, structural alterations and improvements were put in hand at the Station, and have recently been completed at a total cost of about £6,000. This expenditure could not be wholly provided out of the normal annual grant of £15,000, and the grant for 1933 was increased to £17,000.

Beside the work at the Pirbright Station, which is the main centre of the Committee's activities, laboratory experiments (with small animals) were continued at the Lister Institute, the National Institute for Medical Research and the Public Health Laboratory of the University of Manchester. The work at the Lister Institute was, however, transferred to Pirbright during the year. At the request of the Government of Southern Rhodesia an examination of the virus from an outbreak of foot-and-mouth disease in that territory was carried out and a report presented. The Fifth Progress Report of the Committee is in course of preparation.

The expenditure of the Committee in the financial year 1932 was £14,833. Salaries and wages amounted to £6,439; structural alterations at the Experimental Station, repairs, rates and farming expenses to £2,623; laboratory equipment, materials, animals and miscellaneous expenses to £5,751; and the expenses of the Committee to £20. The total expenditure of the Committee from 1924, the year of its appointment, up to March, 1933, was approximately £120,000.

Flax.—The processing of the balances of the 1930 and 1931 stocks of straw at the Somerset flax factories was prac-

EDUCATION AND RESEARCH REPORT.—I

tically completed by the end of September, 1933, and preliminary arrangements for the winding up of the Flax Industry Development Society, to whom the factories at Bunford and Lopen had been leased by the Ministry, were initiated under the Provident and Industrial Societies Acts.

Agricultural Meteorology.—No change occurred in the number (thirty-two) and location of the centres that participate in the Agricultural Meteorological Scheme. The operation of the scheme is supervised by an inter-departmental committee under the chairmanship of Sir Napier Shaw, F.R.S. Meteorological observations were taken at all stations on the modified scale introduced in 1932; and standardized observations on apple trees and on the wheat crop, and phenological observations on selected flowers and plants, were again recorded at certain stations. The wheat-sampling observations were taken during the year at eight centres and arrangements have been made for two additional centres to participate during 1933-34. Periodic reports on the results obtained are being published in the Ministry's JOURNAL.

Agricultural Machinery Testing Committee.—The Committee has continued to supervise the testing of agricultural machinery, on behalf of the Ministry. At the end of September, 1933, forty-five certificates and reports and one confidential report had been issued. Certificates and reports in respect of six individual tests were issued during the year, the machines and appliances comprising a milk cooler, a cattle drinking bowl, a device described as a milk equalizer, a mowing machine, an expanding horse rake, and wheels with pneumatic tyres for farm carts. These tests were carried out at the Institute for Research in Agricultural Engineering, Oxford University, and the National Institute for Research in Dairying, Reading University.

Sugar-Beet.—It has been noted in previous reports that for some years past the beet-sugar factories have provided funds for experimental work in connexion with this crop. For 1933, the factories set aside £5,000 for educational and research work, and an informal Committee consisting of representatives of the factories and of the Ministry was set up to supervise the arrangements. Grants were made for trials at the following centres, in continuation and extension of previous work:—

(1) *Variety Trials*, by the National Institute of Agricultural Botany, Cambridge, at the Institute itself and at the Institute's sub-stations at

EDUCATION AND RESEARCH REPORT.—I

Good Easter, Cannington, Newport (Salep) and Norwich. The Institute also assisted in the conduct of trials at Selby (Yorkshire). The grant for the work was £1,050.

(2) *Machinery and Cultivation Trials*.—Grants of £250 to the Institute for Research in Agricultural Engineering, Oxford University, and £390 to the Norfolk Agricultural Station, Sprowston, were provided for work at these centres in connexion with sugar-beet machinery and cultivation. The cultivation experiments were conducted at the Norfolk Agricultural Station, which also concerned itself with assessing the efficiency of the machinery used. The Institute was responsible for suggesting and carrying out modifications in design intended to improve the working of the machines.

(3) *Manurial Trials*.—A grant of £400 was made for a programme of manurial experiments by the Rothamsted Experimental Station at that station and other centres.

(4) *Beet Molasses Pulp Inquiry*.—Grants totalling £620 were provided for further investigation into the problem of taint in milk arising from feeding beet molasses pulp to dairy-cows, at the National Institute for Research in Dairying and the Midland Agricultural College.

Dried and Ground Poultry Manure.—A series of co-ordinated experiments designed to estimate the manurial value of dried and ground poultry manure was commenced in 1933 in collaboration with the Rothamsted Experimental Station and a number of centres. The results of the experiments are being correlated at Rothamsted.

Extension Lectures.—Arrangements were again made for members of the staffs of Research Institutes, Advisory Centres and the Ministry to deliver lectures on various agricultural subjects at the request of Agricultural Organizers acting in collaboration with local branches of the National Farmers' Union. During the winter session 1932-33, 202 lectures were given by 66 workers at 129 centres in 45 counties, the average attendance being 59.

County Trials of Late-flowering Red Clover.—The trials that were laid down in 1930 at 23 centres under the ægis of the Ministry and the Department of Agriculture for Scotland, to determine the comparative persistency, yielding capacity and disease resistance of various strains of Late-flowering Red Clover, were completed in 1932. The scheme was supervised by the Ministry's Inspectors in conjunction with the Welsh Plant Breeding Station, Aberystwyth. A report discussing the results obtained has been circulated to Research Institutes, County Agricultural Organizers, and others interested.

Scholarships, Fellowships, etc.—Further awards of post-graduate research scholarships and studentships in animal health, under the scheme described in previous reports were made in July, 1933. Particulars of the awards, which

EDUCATION AND RESEARCH REPORT.—I

were made on the advice of the Agricultural Research Council, are given in Table VIII. These scholarships and studentships are normally of three years' duration, part of which a scholar may be required to spend abroad.

During the year ended September 30, 1933, ten research scholars whose appointments have been recorded in previous reports, were pursuing their studies; two were in their first year (one in Germany), three in their second year and five in their third year (one in Central Europe).

No awards of general scholarships, for intending agricultural organizers, teachers and lecturers, have been made since 1931. The awards made in that year terminated on September 30, 1933; two of the scholars spent a term in Sweden, and the other a term in Germany.

It was found possible to make a small provision for travelling research fellowships, the objects of which are to enable agricultural research and advisory workers to travel abroad in order to obtain a closer knowledge of the progress of research and advisory work in other countries, or to represent British agricultural science at international scientific conferences. During 1933 a fellowship was held by Dr. H. Hunter of the Plant Breeding Institute, Cambridge, who visited Sweden, Denmark and France to study the oat breeding and other cereal work in progress in those countries. A grant was also made to enable Sir John Russell, F.R.S., Director of the Rothamsted Experimental Station, to attend the World's Grain Exhibition and Conference at Regina, Canada, as a member of the Government delegation to the conference.

[Part II of the Report, dealing with Agricultural Education, will appear in the next (November) issue.]

EDUCATION AND RESEARCH REPORT.—I

**TABLE I.—EXPENDITURE ON AGRICULTURAL RESEARCH
(INCLUDING LOCAL INVESTIGATION AND ADVISORY
WORK) IN THE FINANCIAL YEARS 1932 AND 1933.**

	1932. £	1933. £ (Subject to slight amend- ment.)
(1) National agricultural research at Research Institutes, mainly of a fundamental and continuous character, but including also specific schemes:		
Capital expenditure	10,243*	4,300*
Annual expenditure	157,848*(a)	157,980*(a)
(2) (i) Imperial agricultural research schemes at Research Institutes:		
Capital expenditure	202†	—
Annual expenditure	19,341†	19,150†
(ii) Contributions to Imperial Agricultural Bureaux	3,125*	3,125*
(iii) Contribution to Imperial Institute of Entomology	1,500*	1,500*
(iv) Contribution to Imperial Mycological Institute	500*	500*
(3) Special research scheme for foot-and-mouth disease	14,833*	17,000*
(4) (i) Special research schemes, national and local, of a definite character and a limited period	1,634*	1,110*
(ii) Ditto, but including some special schemes of a continuing character	2,531†	2,515†
(iii) Ditto, Farm Management Survey	1,888†	2,050†
(5) Local research and specialist advisory work	69,952*(b)	71,000*(b)
(6) Post Graduate Scholarships (Research and Training), Fellowships, etc. ..	4,662§	3,145*
(7) (i) Testing of seeds and potatoes ..	4,915†	4,715†
(ii) Testing of agricultural machinery ..	50†(c)	25†(c)
	£293,124	£288,065

* Financed from Development Fund.

† Financed from Empire Marketing Fund. Does not include expenditure on Empire Marketing Board schemes administered by the Ministry on an agency basis (see Table VI).

‡ Financed direct from Ministry's Vote.

§ Financed from Development Fund, except as to £492 from Ministry's Vote.

(a) Including expenditure on Northern and Southern poultry breeding experiments under National Poultry Institute scheme (1932, £1,320; 1933, £1,205). See Part II of this Report (Education).

(b) Including grant to Norfolk Agricultural Station (1932, £1,016; 1933, £906).

(c) Excess of receipts over expenditure.

**TABLE II.—ANNUAL GRANTS TO RESEARCH INSTITUTES
FROM DEVELOPMENT FUND.**

Institute.	1931-32. £	1932-33. £
Soils and Crops:		
Rothamsted Experimental Station ..	26,210(23)	26,380(23)
Imperial College of Science ..	6,090 (5)	6,160 (5)
Cambridge Plant Breeding Institute ..	3,850 (3)	3,850 (3)
Welsh Plant Breeding Station ..	7,820 (5)	7,385 (5)
National Institute of Agricultural Botany (Administrative and Crop Improvement Branches)	4,350*	4,200*

EDUCATION AND RESEARCH REPORT.—I

TABLE II (*Contd.*)

<i>Institute.</i>	<i>1931-32.</i> £	<i>1932-33.</i> £
Horticulture:		
Agricultural and Horticultural Research Station, Bristol	14,060 (12)	13,830 (12)
Fruit and Vegetable Preservation Research Station, Chipping Campden ..	3,000 (2)	3,000 (2)
East Malling Research Station ..	8,160 (4)	8,355 (4)
Cambridge Horticultural Research Station	3,840 (3)	3,500 (4)
Experimental and Research Station, Cheshunt	4,810 (5)	5,050 (5)
Animal Pathology:		
Royal Veterinary College	4,900 (4)	5,100 (5)
Cambridge Department of Animal Pathology	11,790 (8)	11,870 (8)
London School of Hygiene and Tropical Medicine	5,110 (4)	5,150 (4)
Animal Husbandry:		
Cambridge Animal Nutrition Institute	12,925 (9)	13,020 (10)
Cambridge Small Animal Breeding Institute	900 (1)	900 (1)
National Institute for Research in Dairying	14,370 (8)	14,120 (8)
Economics:		
Oxford Agricultural Economics Research Institute	8,040 (5)	7,780 (5)
Engineering:		
Oxford Institute of Agricultural Engineering	11,840 (5)	10,000 (5)

The figures in brackets indicate the number of graded research workers.

TABLE III.—GRANTS FROM DEVELOPMENT FUND FOR SPECIAL INVESTIGATIONS.

<i>Institute.</i>	<i>1931-32.</i> £	<i>1932-33.</i> £
Crop Variety Trials:		
East Anglian Institute of Agriculture } Harper Adams Agricultural College } Lord Wandsworth Agricultural College } Norfolk Agricultural Station } Somerset County Farm Institute }	2,443	1,257†
Tasting of new varieties of fruit trees:		
Royal Horticultural Society	1,100*	750*
Virus diseases of potatoes:		
Cambridge University	2,770	2,800
Improved management of grass land:		
University College of Wales, Aberystwyth	630	630
Bristol University	75	—
Pig husbandry:		
Harper Adams Agricultural College } South-Eastern Agricultural College, Wye }	560	730

* Year ending March 31.

† In respect of six months ended March 31, 1933, only. After that date, grants for these trials are included in the grant to the National Institute of Agricultural Botany (Administrative and Crop Improvement Branches)—Table II.

EDUCATION AND RESEARCH REPORT.—I

TABLE IV.—SPECIAL RESEARCH GRANTS FROM DEVELOPMENT FUND.

<i>Subject.</i>	<i>Institute.</i>	<i>Investigator(s).</i>	<i>Amount of grant 1932-33.</i> £
1. Use of B.C.G. vaccine in the protection of calves against tuberculosis	Cambridge: Institute of Animal Pathology	Professor J. B. Buxton and Dr. A. S. Griffith	300
2. Soil survey work	Oxford: School of Rural Economy	G. R. Clarke	50
3. Breeding of oats for resistance to frit fly	Do.	N. Cunliffe	235
4. Solids-not-fat in milk	Reading University	M. N. Nicholson and C. E. Lesser	315
5. Broccoli breeding research	Seale-Hayne Agricultural College	F. R. Horne	160
6. Struck and gangrene diseases of sheep on Romney Marsh	Wye: South-Eastern Agricultural College	A. D. McEwen and R. S. Roberts	75

TABLE V.—GRANTS FROM MINISTRY'S VOTE FOR MISCELLANEOUS INVESTIGATIONS.

<i>Investigation and Institution.</i>	<i>Amount of grant, 1932-33.</i> £
Commercial production of virus-free seed potatoes: University College of North Wales, Bangor	475
Bacterial diseases of plants: Imperial College of Science and Technology	238
Basic Slag experiments at various centres: Rothamsted Experimental Station	176
Agricultural Meteorology: Apparatus, observers' courses, etc., at various stations	236
Walnut cultivation: East Malling Research Station	280
Pyrethrum trials: South-Eastern Agricultural College, Wye	9
Horticultural College for Women, Swanley	
Investigations into Economic Ornithology: Oxford University	146
Mycological examination of tubers from indoor wart disease tests at Ormskirk: Rothamsted Experimental Station	50
Correlation of work of provincial dairy bacteriologists: National Institute for Research in Dairying, Reading	26
Grey Squirrel investigations: Oxford University	90
Orchard spraying experiments: South-Eastern Agricultural College, Wye	30
Field investigations of strawberry diseases: Reading University	140
Investigation into blackening of potatoes on cooking: King's College of Household and Social Science	75
Investigations on sulphur dioxide in fruit pulp and jam: Bristol University	51
Investigations into cooking qualities of eggs: King's College of Household and Social Science	10

EDUCATION AND RESEARCH REPORT.—I

TABLE VI.—GRANTS FROM EMPIRE MARKETING FUND.

<i>Institution.</i>	<i>Subject.</i>	<i>Amount of grant, 1932-33*.</i>
East Malling Research Station	Rootstock investigations and extension of facilities for research	£ 6,709(a)
Welsh Plant Breeding Station	Seed production (herbage plants)	4,447
	Overseas grassland adviser (home expenses)	524
Bristol University (Long Ashton Research Station)	Cultural conditions affecting keeping qualities of fruit	1,335
Rothamsted Experimental Station	Virus diseases in plants	1,939
	Black Arm disease of the cotton plant	46†
Experimental and Research Station, Cheshunt	Virus diseases of plants	1,055
National Institute of Poultry Husbandry (Harper Adams Agricultural College)	Poultry (egg and meat) production	1,714
Oxford University (Agricultural Economics Research Institute)	Agricultural Economics in the Empire	229†(c)
Oxford University (Department of Zoology)	Economic ornithology	250(b)
Cambridge University (Animal Nutrition Institute)	Poultry nutrition (fat formation)	385
East Anglian Institute of Agriculture (Essex County Council)	Cultivation of <i>Spartina Townsendii</i> in tidal zones	288

* Accounting year of institution

† Grants paid in respect of schemes, mainly of overseas interest, administered by the Ministry on an agency basis (not included in Table I)

(a) Includes £96 in respect of expenses of visit of East Malling pomologist to Summerland Experimental Station, British Columbia, under scheme for exchange of Empire workers in agricultural science.

(b) Investigations also aided by grant from Ministry's funds (see Table V).

(c) For five months. Grant terminated December 31, 1932.

TABLE VIII.—RESEARCH SCHOLARSHIPS AND STUDENT-SHIPS IN ANIMAL HEALTH.

<i>Name.</i>	<i>Subject.</i>	<i>Institute to which assigned.</i>
Awarded, July, 1932.		
(a) Scholars.		
P. S. Milne	Entomology	University College, Hull.
J. H. Western	Botany	University College of Wales, Aberystwyth.
A. H. A. Wynn	Agricultural Economics	Agricultural Economics Research Institute, Oxford.
(b) Student.		
J. C. D. Hutchinson	Veterinary Science	(i) Lister Institute of Preventive Medicine. (ii) Hannah Dairy Research Institute, Ayr, Scotland.

EDUCATION AND RESEARCH REPORT.—I

TABLE VII.—GRANTS FROM DEVELOPMENT FUND TO ADVISORY CENTRES.

Advisory Centre	1931-32				1932-33			
	General Advisory	Economics	Dairy Bacteriology	TOTAL	General Advisory	Economics	Dairy Bacteriology	TOTAL
Armstrong	3,150	1,430	320	4,900	3,210	1,460	320	4,990
Bristol	4,970	1,840	390	7,200	5,160	1,870	410	7,440
Cambridge	4,450	2,300	450	7,200	4,490	2,070	470	7,030
Harper Adams	3,110	1,460	380	4,950	3,150	1,450	400	5,000
Leeds	1,900	1,050	—	2,950	1,900	1,050	—	2,950
Liverpool (Veterinary Adviser)	850	—	—	850	870	—	—	870
Manchester	2,150	1,450	—	3,600	2,210	1,460	—	3,670
Midland	3,150	1,450	400	5,000	3,130	1,460	420	5,010
Oxford	2,550	—	—	2,550	—	—	—	—
Reading	3,380	1,470	400	5,250	3,560	1,540	430	5,530
Scale-Hayne	3,600	1,470	380	5,450	3,640	1,490	400	5,530
Wye	4,450	1,620	480	6,550	4,655	1,660	500	6,815
Aberystwyth	2,760	2,620	490	5,870	2,830	2,640	510	5,980
(Grassland Adviser)	830	—	—	830	850	—	—	850
Bangor	4,970	—	380	5,350	5,030	—	390	5,420
Cardiff	2,650	—	—	2,650	2,710	—	—	2,710

* Includes part only of the cost of the Veterinary Adviser, the College providing the remainder.

BREEDING POULTRY FOR EGG PRODUCTION

P. A. FRANCIS, O.B.E.,

Poultry Commissioner, Ministry of Agriculture and Fisheries.

METHODS of breeding for high egg production are of great importance to the poultry industry, and particularly to breeders who specialize in this work. Breeders' views on this subject vary considerably, whilst the knowledge possessed by poultry keepers generally is often vague and inaccurate. It is not many years since it was currently believed that if only high-yielding hens were continuously selected for breeding purposes, the progeny would show a gradually increasing degree of fecundity in succeeding generations. This method of selection by itself, however, gives very variable results, and the uncertainties that underlie it have been shown by the work of several scientific investigators—such as Dr. Raymond Pearl in Maine, U.S.A., and Professors Goodall, Punnett and others. Experiments conducted by Dr. Pearl indicated that fecundity was sex-linked in certain breeds and inherited mainly through the male. Later experiments by Professor Punnett, however, showed no such sex-linkage. Gradually the theory has been evolved that the egg records of near ancestors of dam and sire, together with the records of full sisters of the dam and sire are of much more importance as a guide to selection for breeding purposes than the record of the dam by itself. Many breeders believe also that a dam or sire which has been proved to give highly fecund progeny can be depended upon subsequently to produce a large percentage of such progeny.

A most interesting account of some recent experimental work relating to this subject appeared in the January, 1934, number of "Poultry Science."* These investigations were conducted by Dr. Morley Jull at the Experimental Farm of the United States Department of Agriculture at Washington, D.C. Dr. Jull has a high reputation as a poultry geneticist and his work and publications are widely known. In this article the data presented are based on results obtained in

* Official Journal of the Poultry Science Association.

BREEDING POULTRY FOR EGG PRODUCTION

breeding White Leghorns by the progeny test method. The results include the first-year egg records of daughters during the laying years 1928-29, 1929-30 and 1930-31. All the daughters that each dam produced each year were placed in the laying houses, except (1) those physically unfit; (2) families of full sisters of less than five (unless the dam had previously been determined to produce superior progeny); and (3) the few instances in which all the daughters of a given dam were discarded because the majority of her sons and daughters showed marked defects in breed type. The first year's record of a bird was taken as the number of eggs laid in the 365 days following the production of the first egg. During the three years 1,033 birds were placed under test and the only records omitted were those of birds that died, i.e., 13.62 per cent. The average egg production per bird during each of the three years was practically the same, namely, 192.17, 193.50 and 192.84. Conditions of housing, feeding and management were uniform throughout.

The breeding stock used each year consisted of males from dams that laid 225 eggs or more in their first year of laying, mated to females with similar records, provided in addition that male and female had each had a number of sisters with relatively high records. Consideration was also given to the size of egg laid by each female and by her full sisters; in certain instances entire families with high records were rejected because the eggs were too small. If a dam laying eggs of good size had produced daughters the majority of which laid small eggs, none of the daughters were used as breeders and the dam herself was rejected. Males were selected also from families of full sisters that laid eggs of good size. The hatchability of each dam's eggs was considered when selecting pullets to place in the laying house, and in the selection of sons and daughters for future breeding purposes. A dam yielding eggs of less than 75 per cent. hatchability was regarded as a poor breeder.

In order to determine the significance of progeny testing in breeding for egg production, the records dealt with in the article relate to results secured in matings that produced at least three full sisters in a family. The average egg production is shown for all the daughters produced by 19 different sires, together with the number of dams mated to each sire and their average egg production. The highest average egg production per daughter of any one sire was

BREEDING POULTRY FOR EGG PRODUCTION

229 and the lowest 168. It was found that either the sires or the dams or both sires and dams varied considerably in their breeding potentialities. Six sires produced daughters whose average egg production was over 200 eggs per daughter; the daughters of five sires gave an average yield of from 170 to 180; and one sire gave daughters with an average less than 170.

Dr. Jull states that a dam's first year record of egg production is not in itself a criterion of breeding potentialities, but that the kind of progeny she produces is determined largely by the male to which she is mated. Particular dams were mated to different sires in successive years and gave progeny varying widely in fecundity; in fact it is stated that the kind of progeny produced determines the relative value of the given mating rather than the breeding potentiality of either a given sire or dam. In other words, that progeny testing determines the breeding potentiality of a given sire when mated to a given dam, and of a given dam when mated to a given sire. The results also indicated that full sisters mated to the same sire did not necessarily produce similar results.

There is much food for thought in this article. Although in the conclusions drawn by Dr. Jull from his investigations he states that "the dam's record of egg production could not be used as a criterion of her breeding potentiality," earlier in his report he qualifies this conclusion by using the words "in itself" in relation to the dam's record. Having regard to the average egg production obtained in each of the three years from the pullets tested, viz., 192-17, 193-50 and 192-84 respectively, and bearing in mind that these records were made by birds bred from dams which had apparently been selected mainly because they had each produced 225 eggs or more in their first year and were then mated to males bred from dams with similar egg records, it seems difficult to believe that, taken as a whole, high fecundity was not inherited in a satisfactory degree by the progeny. What does seem to emerge from the report, however, is that assumptions regarding the breeding value of any particular bird should be governed largely by considerations of the known performances of her progeny obtained from matings with particular sires. Most breeders nowadays are fully alive to the vital importance of the possession by their breeding stock of such qualities as

BREEDING POULTRY FOR EGG PRODUCTION

stamina, fertility, hatchability, and rearability of their progeny. Unless the breeding stock possess these qualities, the ability merely to produce large numbers of eggs is of little value from a breeding point of view; and when it is remembered that the pedigree breeder has to consider, in addition, size and quality of egg, texture of shell, and breed type, it will be realized that his path is beset with many difficulties. Pedigree breeding, where conscientiously performed, requires a large amount of detailed and expensive work, which explains and indeed justifies for really good stock, prices that to the uninitiated may appear somewhat high.

SAMPLING OBSERVATIONS ON WHEAT: REPORT FOR THIRD AND FOURTH QUARTERS .

IN this JOURNAL for September, 1934, an advance report was given of the yields from the observation plots under this Scheme. This month the summary is completed with the third and fourth quarterly reports.

The events occurring in the third quarter, for which values have been calculated, are (1) maximum shoot density, (2) maximum growth rate, (3) ear emergence.

(1) The date of maximum shoot density ranges from April 12 at Seale-Hayne to May 16 for the variety Yeoman at Newport. There is also an early subsidiary maximum at Woburn at the end of March. With this exception the dates are all later than last year, when they ranged between March 2 and May 11. Yeoman at Newport gave the latest date in both years, and the standard varieties at Seale-Hayne the earliest. Early sowing does not appear to be associated this year with early maximum shoot density. Squarehead's Master reached maximum shoot density before Yeoman at seven of the nine stations, and has given a smaller maximum shoot density at seven of the nine stations. The maximum shoot densities are of the same order as last year, ranging from 2,400 for Squarehead's Master at Plumpton to 6,800 for Yeoman at Cirencester. This is interesting in view of the considerably smaller plant numbers this year at tillering, which have been compensated for by the formation of additional tillers per plant; a fact which may account in part for the later maxima this year.

(2) The maximum growth rates are considerably greater this year at all stations except Boghall. Sprowston and Cirencester both give rates for Squarehead's Master of over 3 cm. a day. Last year the greatest rate was 2.7 cm. a day at Long Sutton. The maximum rates also occur from 10 to 16 days later this year at all stations. The shoot heights are up to 17 cm. greater, so that the differences are ascribable in part to differences in the form of the growth curve. Squarehead's Master (the taller variety) showed a greater maximum rate than Yeoman at all stations. This was also the case last year except at one station. The differences between the dates of the maxima for the two varieties are probably not significant. The standard errors of the differences between the two varieties were computed for Wye, with the following results: difference of date, -0.53 ± 0.81 days; difference of rate, $+0.36 \pm 0.08$ cm. per day.

The shoot number at maximum growth rate ranges from 1,400 at Plumpton to 3,200 at Wye, the average reduction from maximum shoot number being about one-third. There is considerable further reduction by the time of ear emergence, most stations then having values less than one-half the maxima.

(3) The dates of ear emergence range from June 13-14 at Seale-Hayne to July 2-3 at Boghall, up to 10 days later than last year. The rates of emergence are much the same as last year, with the exception of the remarkably low rate of 5-6 per cent. per day at Woburn. Squarehead's Master is earlier than Yeoman at all stations, usually by about 1-2 days. There are no consistent differences in rate between the two varieties, though some of the differences obtained

SAMPLING OBSERVATIONS ON WHEAT

are significant. For Squarehead's Master the shoot height is 8-14 cm. greater than for Yeoman, there being considerable differences in shoot height from station to station. Shoot height at ear emergence is greater this year at all comparable stations except Sprowston.

In the fourth quarter the harvest is the principal event. Particulars are given in Table II. The most striking point is the very high average level of yield attained this year. The average of the two standard varieties at the seven stations for which values for 1933 are also available is 34.4 cwt. of grain and 52.7 cwt. of straw, as compared with 24.9 cwt. of grain and 46.9 cwt. of straw in 1933. The 1933 figures were probably somewhat depressed by serious bird damage at Wye, but even so the yield of grain is substantially higher in 1934, and this year in fact must be considered as an exceptionally favourable wheat year. Past results obtained with the permanent wheat field at Rothamsted would indicate that this was due, in part at any rate, to the exceptionally dry winter.

The highest yields this year for both varieties were obtained at Wye. The yields given for this Station in the advance report, published last month (p. 534), require to be doubled, there having been a mistake in the information originally supplied by the Station. Newport has again achieved high yields, and the figure of 46 cwt. of grain per acre for Yeoman was confirmed by an almost identical yield on some neighbouring plots that were threshed completely.

The dates fit for cutting and of harvest this year were slightly earlier at Seale-Hayne, but later at the other stations at which the dates were recorded.

There is little to choose between the two standard varieties on the average. Victor did outstandingly well at Seale-Hayne, and at no station did the locally-chosen variety yield appreciably less than the standard varieties.

Dry matter determinations were again made at Rothamsted and Newport. Table III gives the results. As last year, the total dry matter at the later date gives a very good approximation to the total yield of grain and straw. This year the earlier figure gives much the same value as the later, whereas last year there was a considerable increase. Whether any of the observations will furnish information on the grain-straw ratio, so that the yield of grain can be determined from a preliminary dry matter determination, can only be considered when more data are available.

SAMPLING OBSERVATIONS ON WHEAT

TABLE I.—SAMPLING OBSERVATIONS ON WHEAT, 1933-34, THIRD QUARTER.

Station	Variety	Maximum Shoot Density				Maximum Growth Rate				Ear Emergence			
		Date	Shoot Density per 32m.	Shoot height cm.	Date	Rate cm. per day	Shoot Density per 32m.	Shoot height cm.	Date	S.E. of diff. of date	Rate % per day	S.E. of diff. of rate	Shoot Density per 32m.
CIRENCESTER Gloucestershire	Squarehead's Master	Apr. 28.90	4742	7.60	—	3.36	—	—	—	—	—	—	—
	Yeoman	Apr. 27.47	6816	6.20	—	2.51	—	—	—	—	—	—	—
	Squarehead's Master	Apr. 25.58	2825	2.35	June 13.36	2.24	1666	57.70	June 22.97	—	15.2	—	1298
ROTHAMSTED Hertfordshire	Yeoman	May 13.76	2972	6.79	June 12.02	1.95	2046	43.70	June 23.56	±0.179	17.3	±1.435	1358
	Victor	Apr. 18.41	2874	1.60	June 8.20	1.99	2146	41.89	June 22.78	—	15.3	—	1402
	Squarehead's Master	Apr. 27.05	2381	3.57	June 7.02	2.04	1426	44.40	June 18.72	±0.288	14.4	±0.67	1174
PLUMPTON Sussex	Yeoman	May 2.64	2974	4.18	June 10.13	1.69	1602	38.73	June 19.50	—	15.2	—	1389
	Squarehead's Master	Apr. 12.89	3672	3.45	—	—	—	—	June 13.30	—	13.8	—	1184
SEALE-HAYNES Devonshire	Yeoman	Apr. 12.50	3757	2.02	—	—	—	—	June 14.89	±0.182†	18.8	±1.179†	1179
	Victor	Apr. 10.87	3442	3.01	—	—	—	—	June 13.80	—	15.0	—	1359
	Squarehead's Master	May 1.27	5077	5.54	May 31.75	2.59	3188	52.70	June 22.06	±0.211	12.5	±0.347	2559
WYE† Kent	Yeoman	May 6.25	4925	6.28	June 1.22	2.23	3503	44.03	June 23.21	—	17.0	—	2773
	Squarehead's Master	May 1.80	3167	2.55	June 18.16	2.27	1770	54.24	July 2.72	±0.150	19.7	±1.799	1439
BOGHALL Edinburgh	Yeoman	May 4.25	3812	2.46	June 19.76	1.98	2072	48.90	July 3.73	—	18.8	—	1892
	Squarehead's Master	May 10.22	2931	10.35	June 7.83	2.94	2068	59.56	June 21.32	±0.118	17.0	±2.696	1764
NEWPORT* Shropshire	Yeoman	May 16.42	3065	11.77	June 6.62	2.71	2411	47.21	June 24.19	—	12.6	—	1823
	Squarehead's Master	Mar. 29.99	3026	—	—	—	—	—	June 18.61	—	5.6	—	1851
WOBURN Bedfordshire	Yeoman	Apr. 26.96	3576	5.29	—	—	—	—	June 22.29	—	5.0	—	1760
	Victor	Apr. 1.29	3190	—	—	—	—	—	June 21.38	—	6.4	—	2220
	Squarehead's Master	Apr. 29.03	2836	2.81	June 13.24	3.02	1956	43.39	June 26.42	—	13.6	—	1449
SPROWSTON Norfolk	Yeoman	Apr. 30.48	3590	2.31	June 14.81	2.39	2323	35.38	June 28.31	±0.284	13.2	±1.466	1670
	Wilhelmina	Apr. 29.69	2908	2.98	June 16.57	2.23	2020	44.47	June 26.68	—	14.5	—	1637

* Observations of maximum growth rate and ear emergence are based on five instead of eight blocks.
† Based on 32 three-quarter metre samples.
‡ Shoot and ear heights are the mean of 193 observations.
§ Certain values (indicated by blanks in the table) could not be determined because the observations at the stations in question were incomplete.

SAMPLING OBSERVATIONS ON WHEAT

TABLE II.—SAMPLING OBSERVATIONS ON WHEAT, 1933-34, FOURTH QUARTER.

Station	Variety	Last observations before harvest			Date fit for cutting	Date of harvest	Distance between rows in.	Yields and Standard Errors of differences in cwt. per acre		
		Date	Ear density per 32m	Ear height (cm.)				Grain	S.E. of diff.	Straw
CIRENCESTER Gloucestershire	Squarehead's Master	July 30	1425	122.83	\$	Aug. 3	7.0	28.1	2.19	59.2
	Yeoman		2032	110.13	—\$			37.2		61.6
ROTHAMSTED Hertfordshire	Squarehead's Master		1361	102.18	July 30			32.3		45.0
	Yeoman	Aug. 1	1562	92.68	July 30	Aug. 1	6.0	32.0	1.97	46.4
PLUMPTON Sussex	Victor		1480	93.55	July 30	July 31		32.0		41.1
	Squarehead's Master	July 31 and Aug. 1	1250	96.35	July 30	and Aug. 1	7.0	37.6	2.07	43.5
SEALE-HAYNE Devonshire	Yeoman	Aug. 1	1447	82.22	July 31†	Aug. 1		32.7		35.8
	Squarehead's Master		1160	104.81	July 21			33.0		48.3
WYE Kent	Yeoman	July 24	1151	85.67	July 24	July 24	7.0	31.8	0.88	40.5
	Victor		1325	94.18	July 21			43.6		53.6
BOGHALL Edinburgh	Squarehead's Master	Aug. 7	2445	125.05	Aug. 5	Aug. 6	7.0	47.6	3.02	83.6
	Yeoman		2764	115.00	Aug. 10			52.0		84.4
NEWPORT Shropshire	Squarehead's Master	Aug. 8	1410	123.32	Aug. 25	Aug. 25	6.0	35.7	1.83	56.6
	Yeoman	Aug. 13	1842	113.78	Aug. 25	Aug. 13	7.0	35.7	1.15	61.9
WOBURN Bedfordshire	Squarehead's Master		1723	129.25	Aug. 9			41.4		63.8
	Yeoman		1993	118.33	Aug. 12			46.0		68.1
SPROWSTON Norfolk	Squarehead's Master	July 26	1745	96.10†	July 26†			20.5		37.5
	Yeoman	Aug. 15 and 16	1632	75.28†	July 26	July 26	9.1	17.2	1.71	28.8
	Victor		2032	89.71†	Aug. 13	Aug. 15 and 16		23.5		42.0
	Squarehead's Master		1332	106.40	Aug. 13		6.75	30.5	1.80	37.5
	Yeoman		1623	93.64	Aug. 13			26.0		35.2
	Wilhelmina		1559	99.02	Aug. 15			31.2		38.2

* Based on 35 three-quarter metre samples.
† Some of the Yeoman and Squarehead's Master was not quite fit at cutting, and would have been better if left for a few more days.
No ear height taken on last observation before harvest. Figures got from observation before July 13.
‡ No dates sent with returns.
§ Lodging reported.
¶ Ear height the mean of 198 observations.

SAMPLING OBSERVATIONS ON WHEAT

Sampling observations on commercial fields were taken by five stations: Rothamsted, Wye, Newport, Woburn and Boghall. The results are not yet available for discussion.

NOTE.—A mistake was made in the drilling of one of the eight blocks at Newport, Squarehead's Master being sown where Yeoman should have been, and vice versa. This was not noticed until the third quarter, and corrections require to be made to the figures given for Newport in the first and second quarterly reports. In the first quarter, the plant density per 32 metres drill (Dec. 15) should be: Squarehead's Master 534, Yeoman 526. In the second quarter, the tilling observations should read:—

Station	Variety	Tillering				
		Date	Standard Error of diff.	Rate. (Tillers per 100 plants per week)	Standard Error of diff.	Density (Plant number per 32 metres)
NEWPORT Shropshire	Squarehead's Master	Mar. 25.09		48.3		753
	Yeoman	Mar. 28.87	± 0.19	42.8	± 2.76	683

TABLE III.—DRY MATTER OBSERVATIONS.

Station and Variety	Date	Dry matter cwt. per acre	Percentage dry matter	Date	Dry matter cwt. per acre	Percentage dry matter	Yields cwt. per acre	
							Grain	Straw
NEWPORT Squarehead's Master	July 13	100.8	50.7	July 27	92.2	53.5	41.4	63.8
	July 13	107.1 ± 7.15	52.6 ± 9.54	July 27	101.3 ± 3.57	52.3 ± 4.68	46.0	68.1
ROTHAMSTED Squarehead's Master	July 9	60.0	42.4	July 23	69.7	55.7	32.3	45.0
	July 9	55.9	42.0	July 23	74.1	54.8	32.0	46.4
	July 9	63.4	41.4	July 23	70.2	55.6	32.0	41.1
	July 9	± 1.76	± 0.95		± 1.67	± 2.60		

MARKETING NOTES

Wheat Act, 1932.—*Ascertained Average Price of Home-grown Millable Wheat in 1933-34.*—After consultation with the Wheat Commission the Minister has made the Wheat (Ascertained Average Price) Order, 1934, certifying and prescribing that, during the cereal year ended July 31, 1934, registered wheat growers sold 29,570,000 cwt. of millable wheat of their own growing at an average price of 4s. 7-63d. per cwt:

Final Deficiency Payment to Wheat Growers for 1933-34.—On September 14 the Wheat Commission despatched cheques to 85,615 registered growers in respect of the final payment of deficiency payments for the cereal year 1933-34. The aggregate amount involved was £3,005,460, but after adding about 1,000 further payments where, for some reason or other, the Commission have had to investigate the title of persons claiming the deficiency payments, the amount disbursed in this final payment will be about £3,069,000. This will bring the total payment for the year, including the advance payments made in November, 1933, and in February, April and July, 1934, to approximately £7,178,500, or an average of £83 per registered grower.

The deficiency payment for 1933-34 is equivalent to 4s. 10-3d. per cwt. (21s. 10-35d. per quarter) in respect of all sales of wheat credited to growers for that year, from wheat certificates delivered to the Commission.

29,551,000 cwt. of millable wheat were sold by the 86,600 growers who have qualified for deficiency payments, and 189,650 wheat certificates relating to the sales of this wheat were delivered to the Commission.

Milk Marketing Scheme.—*Milk Contract Prices, 1934-35.*—Following an agreement concluded between the Milk Marketing Board and the Distributive Trade, the Board has prescribed the terms of the contract under which registered producers will be required to sell milk by wholesale during the twelve months period October 1, 1934, to September 30, 1935.

The wholesale prices of milk sold for liquid consumption are to be the same in all the eleven regions of the Milk

MARKETING NOTES

Marketing Scheme. In the first two contracts covering the period October 6, 1933, to September 30, 1934, two scales of prices were fixed, viz., one for the South-Eastern region and another for all other regions. Moreover, under the new agreement no distinction is made between the South-Eastern region and the other regions in the transit risk allowance on milk delivered to approved depots; the allowance is now to be $\frac{1}{2}$ d. per gal. on all milk so delivered.

The new prices, with those for the corresponding months of the year ending September 30, 1934, are as follows:—

Month	1933-34		1934-35	
	All regions except the South-Eastern		South-Eastern region	
	s.	d.	s.	d.
October ...	1	3	1	4
November ...	1	4	1	4
December ...	1	4	1	5
January ...	1	4	1	5
February ...	1	4	1	4
March ...	1	2	1	2
April ...	1	0	1	1
May ...	1	0 $\frac{1}{8}$ *	1	0 $\frac{1}{8}$ *
June ...	1	0	1	0
July ...	1	0	1	1
August ...	1	0	1	1
September...	1	0	1	1
Annual price per 12 gal.	13	9 $\frac{1}{8}$	14	4 $\frac{1}{8}$

* The $\frac{1}{8}$ d. in May represents the purchaser's share of a joint contribution of $\frac{1}{4}$ d. per gallon for milk publicity purposes.

The re-sale of milk by the purchaser is governed by a clause in the contract that provides for a graduated scale of additions to the above prices according to the quantity of milk sold. The addition varies from $1\frac{1}{2}$ d. per gal. on quantities not exceeding 500 gal. per day, to $\frac{1}{2}$ d. per gal. on quantities exceeding 1,500 gal. per day.

The prices of milk used for manufacture remain substantially unchanged and are as follows.—

Butter, cheese and condensed milk for export:—

A price equal to the average price per lb. of finest white Canadian and New Zealand cheese less a sum of $1\frac{1}{2}$ d. (Condensed milk for export is subject to a minimum of 4d. per gallon.)

Condensed milk (not for export) and natural sterilized milk (for export)

Milk powder	6d.
Fresh cream, ice-cream, soft curd and cream cheese ..	4 $\frac{1}{2}$ d.
Tinned cream	7 $\frac{1}{2}$ d.
Chocolate	5d.
Other milk products	8d.
	9d.

MARKETING NOTES

The above formula for determining the price of milk for manufacture into cheese and condensed milk for export may, however, be varied by the Board as from April 1, 1935.

As regards retail prices, four different groups of areas are scheduled in which *minimum* retail prices are to be charged, but the contract provides that the Board may by resolution reduce the minimum price applicable to any area if the retailers of milk (including producer-retailers) in that area recommend that such reduction should be made. The arrangements are as follows:—

(a) In areas administered by Rural District Councils or in areas with less than 10,000 inhabitants, administered by Municipal Borough or Urban District Councils, the minimum retail price will be 2s. per gallon in all months except May and June, 1935, when it will be 1s. 8d. per gallon.

(b) In areas with a population exceeding 10,000, but not exceeding 25,000 inhabitants, administered by Urban District or Borough or County Borough Councils, the minimum price will be 2s. 2d. per gallon for the six months October to March and 2s. for the six months April to September.

(c) In areas outside the South-Eastern region with a population exceeding 25,000 inhabitants, administered by Urban District, or Borough, or County Borough Councils, the minima will be 2s. 4d. per gallon for the six months October to March and 2s. for the six months April to September.

(d) In areas within the South-Eastern region, with a population exceeding 25,000 inhabitants, administered by Urban District, or Borough, or County Borough Councils, and also in the areas of the City of London and the Metropolitan Police District, the minima will be 2s. 4d. per gallon for the eight months October to April together with September, and 2s. for the four months May to August.

A reduction of 4d. per gallon from the full retail price is allowed on semi-retail sales exceeding one gallon, but not exceeding four gallons per day, and a reduction of 6d. per gallon on similar sales exceeding four, but not exceeding ten, gallons per day.

Withdrawal of Exemption of Small Sales by Producer-Retailers.—The Milk Marketing Board states that, as from October 1, all registered producers who sell milk by retail must be licensed. This decision revokes a previous resolution whereby sales of milk not exceeding one gallon a day were excluded from Part VI of the Scheme. In future, therefore, every registered producer who retails milk (no matter how small the quantity) must have a producer-retailer's licence issued by the Board.

Prices for August.—The wholesale contract price for liquid milk in August was 1s. 1d. per gal. in the South-Eastern region and 1s. per gal. in all other regions. The manufacturing price for milk manufactured into butter or

MARKETING NOTES

cheese or condensed milk for export was 4d. per gal., an increase of $\frac{1}{4}$ d. on the price for July. The average price obtained for all milk going into manufacture was 5.63d. per gal. as compared with 5.67d. in the previous month; both figures include the Government advance payable in respect of manufacturing milk.

Regional pool prices and producer-retailers' contributions, compared with those for July, were as follows:—

Region.	Pool Price.		Producer-Retailers' Contributions.	
	(Pence per gal.)		(Pence per gal.)	
	July.	August.	July.	August.
Northern	10 $\frac{1}{8}$	10 $\frac{3}{8}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$
North-Western ..	10 $\frac{1}{8}$	10 $\frac{1}{8}$	1 $\frac{9}{16}$	1 $\frac{9}{16}$
Eastern	10 $\frac{1}{8}$	11	1 $\frac{3}{8}$	1
East Midland ..	10 $\frac{1}{8}$	10 $\frac{1}{8}$	1 $\frac{9}{16}$	1 $\frac{9}{16}$
West Midland ..	10 $\frac{1}{8}$	10 $\frac{1}{8}$	1 $\frac{9}{16}$	1 $\frac{9}{16}$
North Wales ..	10 $\frac{1}{8}$	10 $\frac{1}{8}$	1 $\frac{9}{16}$	1 $\frac{9}{16}$
South Wales ..	10 $\frac{1}{8}$	10 $\frac{1}{8}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$
Southern	10 $\frac{1}{8}$	11	1 $\frac{3}{8}$	1
Mid-Western ..	10 $\frac{1}{8}$	10 $\frac{1}{8}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$
Far-Western ..	10 $\frac{1}{8}$	10 $\frac{1}{8}$	1 $\frac{9}{16}$	1 $\frac{9}{16}$
South-Eastern ..	11 $\frac{1}{8}$	11 $\frac{1}{8}$	1 $\frac{9}{16}$	1 $\frac{1}{8}$
Average	10.52	10.77	1.43	1.24

Producer-retailers, who did not sell milk by wholesale other than on contracts carrying level delivery premiums, were credited with a level delivery premium of $\frac{1}{2}$ d. per gal. off the above contributions.

The inter-regional compensation levy was fixed at 1d. per gal. on all liquid milk sales, and the whole of the proceeds were distributed among the regional pools in proportion to the amount of manufacturing milk sold in each region.

A general expenses levy of $\frac{1}{4}$ d. per gal. on all wholesale milk sales was again charged in August.

Sales of milk on contract were estimated to be:—

	Gallons.	Per cent.
Liquid milk	44,158,935	70.7
Manufacturing milk ..	18,316,295	29.3
	62,475,230	100.0

In addition, milk manufactured into cheese on farms was estimated to amount to 3,004,916 gal., as compared with 3,447,646 gal. in July.

Farmhouse Cheesemakers' Scheme.—Details of the scheme agreed between the Milk Marketing Board and the National Cheese Council concerning the sale and utilization of milk produced by Farmhouse cheesemakers for the

MARKETING NOTES

twelve months' period October 1, 1934, to September 30, 1935, are as follows:—

- (i) Contracts will be prepared giving the farmhouse cheesemaker the following options:—
 - (a) to manufacture into cheese the whole of his production on the farm for the twelve months from October 1, 1934, to September 30, 1935;
 - (b) to sell the milk produced on his farm from October 1, 1934, to March 31, 1935, through the Board, and thereafter until September 30, 1935, to manufacture his production of milk into cheese at the farm;
 - (c) to manufacture into cheese at the farm the production of milk for the month of October, 1934, and from April 1, to September 30, 1935, and to sell the milk produced on his farm from November 1, 1934, until March 31, 1935, through the Board.

The producer must declare at the time of making the contract which option he intends to exercise.

- (ii) The producer must find his own market. In the event of his being unable to do so after exercising due diligence, he should apply to the Marketing Officer of the Milk Marketing Board for assistance in finding a buyer.
- (iii) The farmhouse cheesemaker, either in his capacity as a milk seller or as a manufacturer, must pay the expenses levy of the Board.
- (iv) The farmhouse cheesemaker will be entitled to participate in the benefits of the Accredited Producers' Scheme; which means that he will be called upon to pay such levies as may be imposed, and, on qualifying, will be entitled to the premiums.
- (v) The Board will purchase the farmhouse cheesemakers' milk on the same conditions as are contained in the present contract, but the allowances will be as follows:—

Per Gallon of Milk made into Farmhouse Cheese—

From October 1, 1934, to April 30, 1935, the Government advance under the Milk Act, 1934, plus the sum of 3d.

From May 1, to September 30, 1935, the Government advance under the Milk Act, plus the sum of 2½d.

Should the Government advance during the period of the contract be a sum of less than 1½d. per gallon, the Board will increase the farmhouse cheesemakers' allowances by one-half of the difference between the actual Government advance and 1½d. (Thus, if the Government advance is 1d. per gallon for any month, then during that month the Board will add an extra ½d. to the allowance.) From this allowance there will be the expenses levy deduction referred to in paragraph (iii) above.

The allowance for Caerphilly cheese will be the Government advance under the Milk Act, plus one-half of the foregoing allowance by the Board.

- (vi) The minimum number of cows to be kept by a cheesemaker to be eligible for the farmhouse cheesemaker's contract is eight.

Pigs and Bacon Marketing Schemes: Price of Bacon Pigs for September.—The price of the "basic" pig (Class 1, Grade C) for September under the form of contract prescribed by the Pigs Marketing Board was 11s. 5d. per score, a decrease of 1d. on the price for August.

Geographical Distribution of Bacon Pig Production.—An analysis by the Pigs Marketing Board of the numbers of bacon pigs contracted for in each county during the

MARKETING NOTES

present contract period shows that production is heaviest in the south-western counties. Practically one-third of all the pigs contracted for were in the six counties of Cornwall, Devon, Somerset, Dorset, Wiltshire and Gloucestershire—an area which normally includes only about one-fifth of the pig population of the country. The East Anglian counties are only moderate producers of bacon pigs, having regard to the density of pig population in that region. The production of bacon pigs under contract is lowest in Wales and in those counties which are situated close to a good pork market, e.g., the Home Counties and the northern industrial area.

Potato Marketing Scheme.—It was originally intended to bring into operation on September 1 a regulation prohibiting the wholesale sale of potatoes by registered producers, except through the agency of merchants (including auctioneers) who had been duly authorized by the Potato Marketing Board. The authorization of such merchants, upon conditions prescribed by the Board, is proceeding, but it has not been found possible to complete and publish the list by the date originally chosen. The Board has, therefore, notified growers that they may continue to deal with any merchant until the official list is sent to them. The prohibition of sales of potatoes on commission remains unaffected. This prohibition became operative from September 1 and applies also to potatoes sold in markets by auctioneers on behalf of registered producers, though the Board is prepared to consider application for exemption in special cases. On the same date, under the provisions of paragraph 67 of the Scheme, the prohibition of the sale of all potatoes (except new potatoes) capable of passing through a riddle of 1½-in. mesh, again took effect.

Elections of district members of the Board will take place on Saturday, October 6, in each of the nine districts into which Great Britain is divided for the purposes of the Scheme. The first Annual General Meeting of registered producers will be held on Thursday, October 18, at which five special members of the Board will be elected. The present Board goes out of office on October 31.

Demand notes were sent to every registered producer on September 1 for the annual contribution to the Fund under

MARKETING NOTES

the Scheme. The rate of contribution fixed by the Board is 5s. per acre of the registered producer's potato acreage as at that date.

Hops Marketing Scheme.—The Hops Marketing Board has fixed Tuesday, October 2, as the last day for tendering to the Board hops of the 1934 season. After that date the Board may refuse to accept delivery of new season's hops.

Following upon the allotment to each registered producer of a "basic quota" under the terms of the recent amendment of the Scheme, the Board has estimated the total market demand for hops of the 1934 season at 224,000 cwt., representing 97 per cent. of the total of the basic quotas. The annual selling quota of each producer for the current season will therefore be 97 per cent. of his basic quota.

Producers have been advised by the Board to pick a quantity of hops in excess of their annual quotas, so that they may have sufficient good hops to fill their quotas. The Board has also announced that an advance of £5 per pocket of sound quota hops will be made as soon as possible after the producer's entire growth has been received into an approved warehouse.

Committee of Investigation for England.—The Committee have reported on a complaint made by the Amalgamated Master Dairymen, Ltd., against the operation of the Milk Marketing Scheme. The Association's complaint was that they had been placed at a competitive disadvantage compared with large manufacturers by the action of the Milk Marketing Board in restricting the allowance for manufacturing rebates to purchasers who buy not less than 500 gal. of milk per day and use for manufacturing purposes not less than 300 gal. of milk per day. The Association asked that these restrictions should be removed.

On the evidence and arguments submitted to them, the Committee find that to the extent that the restrictions imposed by the Milk Marketing Board prevent small manufacturers from claiming a rebate, the action of the Board may fairly be said to be contrary to the interests of Amalgamated Master Dairymen, Ltd. But the Committee find that the action of the Board of which complaint is made is justifiable; that it is in the interest of milk producers and milk manufacturers and may, therefore, be said to be in the public interest.

MARKETING NOTES

Consumers' Committee for England.—The results of the Committee's deliberations on the question of retail milk prices are embodied in the following report made to the Minister on July 30, 1934:—

Milk Marketing Scheme, 1933.

1. In our report dated February 19, 1934, on the effect of the Milk Marketing Scheme, 1933, on consumers of milk, we referred, *inter alia*, to the provisions in the wholesale contracts for the six months to March 31, 1934, which left the fixing of retail prices in the various districts to the distributors themselves, but were designed to secure that no distributor of milk bought under the contracts should sell at a price lower than the prevailing retail price in the district. We stated in that report that we were not prepared to accept as axiomatic the assumption that the fixing of wholesale milk prices necessitated the fixing of retail milk prices. We expressed the view that, if contracts were to contain some provision in regard to minimum retail prices it should take the form of prescribing a minimum margin or margins above the wholesale price, and that such margin should be based on a figure low enough to give not more than a reasonable return to the distributors in any area working under the most economical conditions or giving the least expensive service consistent with efficiency.

2. The current form of agreement issued by the Milk Marketing Board for sales of milk by wholesale in the period from April 1 to September 30, 1934, contains a clause providing that the purchaser shall not sell by retail any milk, nor permit the milk to be delivered under the agreement to be sold by retail, at a "cut price," which is defined as a price less than the appropriate minimum retail price. The appropriate minimum retail price is defined as a price exceeding the wholesale purchase price by amounts varying from 8d. to 10d. per gallon according to the different types of district in which the milk is sold.

3. The minimum margins prescribed for the South-Eastern region are 10d. per gallon for the London area and any area administered by a Municipal or County Borough Council with a population of more than 10,000, and 8d. per gallon for areas administered by Rural District Councils and other areas of less than 10,000 inhabitants. The minimum margins prescribed for all other regions are 10d. per gallon for areas with populations exceeding 50,000 administered by Borough or County Borough Councils; 9d. per gallon for areas similarly administered with populations between 10,000 and 50,000; and 8d. per gallon for areas administered by Rural District Councils and other areas of less than 10,000 inhabitants.

4. There is a proviso enabling the Board to reduce the minimum price for any district following on a resolution recommending such a reduction passed by persons representing the bulk of the milk sold by retail in the district.

5. In our opinion this clause in the current form of contract represents an improvement of the provision contained in the previous agreement. We understand that distributors in the various districts still meet and discuss what the retail price shall be, and that general effect is given to decisions so reached. But individual distributors are now free to sell at a lower figure provided that this does not fall below the minimum prescribed under the contract. We consider, however, that the existing arrangement cannot be said adequately to satisfy the conditions which we suggested in our previous report. In that report we pointed out that the working costs of distributors varied considerably in different parts of the country and that in even quite a small area these differences might exist. "In part," we said,

MARKETING NOTES

" they may be due to local conditions such as those which distinguish urban from rural areas, but they also arise because the services rendered by distributors vary very widely. Some distributors sell milk in bottles and some 'loose'; some make two deliveries daily and some only one; some pasteurize their milk, while others do not."

6. As already mentioned, we recommended that the Milk Marketing Board, if it prescribed a minimum margin for any area, should base it upon a figure low enough to give not more than a reasonable return to the distributors in that area working under the most economical conditions or giving the least expensive service consistent with efficiency.

7. Having regard to the wide variations which occur in the character and cost of distributive services we do not consider that the margins prescribed by the Milk Marketing Board under the present agreement are fixed at sufficiently low levels. We fully appreciate the difficulties confronting the Board in connection with the question of retail prices and the necessity of negotiating the terms of contract with the distributive trade. We feel, however, that the provisions in the current agreement relating to the resale of milk by retail are open to serious objections from the consumer's point of view, and must tend to impose on certain sections of the public charges for milk which are out of proportion to the services rendered in its distribution. We recommend that consideration should be given to the question of devising a more satisfactory substitute for the present arrangement. The following seem to be the alternative lines of approach to the problem:—

(1) the prescribing, according to different types of district, of margins low enough to give not more than a reasonable return to the distributors in each district working under the most economical conditions or giving the least expensive service consistent with efficiency (as recommended in conclusion (c) of our report of February 19, 1934);

(2) the prescribing of margins not related merely to different types of district, but to the various types of service prevailing in a district; or

(3) the abandonment of any attempt to control the price at which milk shall be sold by retail, retail prices being left to the free play of competition.

Following upon the publication of the terms agreed upon between the Milk Marketing Board and the Distributive Trade as conditions of the contract for the sale of milk by wholesale during the twelve months' period October 1, 1934, to September 30, 1935, the Committee has addressed the following letter to the Minister:—

Milk Marketing Scheme, 1933.

" With reference to the report which we made to you on July 30 last, we write to call attention to the fact that, under the terms of the wholesale milk contracts for the period of twelve months ending September 30, 1935, which have recently been prescribed by the Milk Marketing Board after agreement with the representatives of the distributors, the margins between the liquid milk regional prices and the minimum appropriate retail prices are in general even higher than those provided for in the contract covering the six months ending September 30, 1934."

Regulation of Imports of Agricultural Products.—
Live Cattle and Meat.—Concurrently with the setting-up of the necessary machinery for the administration of the Cattle

MARKETING NOTES

Industry (Emergency Provisions) Act, 1934, consideration was given to the question of complementary measures for regulating imports of live cattle and meat. A programme for the regulation of imports into the United Kingdom in the second half of 1934 was accordingly prepared and communicated to the Governments of the Southern Dominions and Canada on July 27. They were informed that as regards the Irish Free State the existing reduction of 50 per cent. on imports of fat cattle, coupled with the "stand-still" in imports of store cattle and the total prohibition of imports of fresh beef and veal from that source, would be continued. As regards foreign countries, the programme provided for (a) a reduction of $11\frac{1}{2}$ per cent. on imports of chilled beef in the fourth quarter of 1934, compared with imports in the corresponding quarter of the Ottawa standard year, following proportionate reductions of 10 per cent. and $14\frac{1}{2}$ per cent., respectively, in the first and second halves of the third quarter, and (b) a continuance of the reduction of 35 per cent. in imports of frozen beef and veal, and mutton and lamb, specified in the Ottawa Agreements Act, 1932; and foreshadowed arrangements for the regulation of imports of frozen pork from foreign sources in the six months, July-December, 1934.

The proposals made in regard to imports from the Dominions (other than the Irish Free State) are under discussion with their respective Governments.

Processed Milks.—In the August, 1934, issue of this JOURNAL (pp. 483-4) was quoted an announcement made by the Minister in reply to a question put in the House of Commons on July 9, in regard to the voluntary regulation of imports of processed milks.

The situation in the market for processed milks has been further reviewed in the light of a report made by the Market Supply Committee, and the main foreign supplying countries have been approached with proposals on the following lines:—For *condensed whole and condensed skimmed milk*, a reduction of 30 per cent. during the four months September-December, 1934; for *milk powder* a reduction of 25 per cent. during the same period of four months; and for *cream* a reduction of 35 per cent. during the three months October-December, 1934, the base period for the calculation of allocations in each case being the corresponding months of the year June, 1932, to May, 1933. Foreign countries with

MARKETING NOTES

smaller interests in the market have been asked to observe a "standstill" in their supplies to the end of this year. The reductions proposed in the case of imports from the Irish Free State for the fourth quarter of the year were 15 per cent. for condensed whole and condensed skimmed milk, and 17½ per cent. for cream, based on imports in the corresponding quarter of 1933.

Potatoes.—The Market Supply Committee have submitted a report embodying a general plan for the regulation of imports of potatoes. Briefly, the plan provides for the control by licence of imports of potatoes into the United Kingdom. Imports of maincrop potatoes will broadly be permitted only to the extent that the home crop falls short of the normal requirements of the market. Reasonable provision will be made for imports of new potatoes in the spring and early summer months.

This plan has been adopted in principle and will be brought into operation on November 1, 1934, as from which date imports of potatoes will be regulated by Order of the Board of Trade under the Agricultural Marketing Act, 1933.

Meanwhile, arrangements have been made for the regulation of imports on a voluntary basis during the intervening period. The Governments of the Irish Free State, the Netherlands and Belgium have been asked to limit exports to this country in the months of September and October to quantities approximating to those exported in the corresponding months of 1933, namely, 1,000 tons from the Irish Free State, 3,000 tons from the Netherlands and 60 tons from Belgium. Governments of exporting countries having no regular interest in the supply of maincrop potatoes to this market (viz., Spain, Poland, Denmark, Sweden, Norway, Finland, Estonia and Germany) have been asked not to resume the exportation of potatoes to the United Kingdom during the period in question.

Eggs.—Pending receipt of the reports of the Reorganization Commissions for Eggs and Poultry, the Government have given further consideration to the situation in regard to the supplies of eggs in shell, in the light of a report on the subject from the Market Supply Committee. As announced by the Minister on March 15 last, the Governments of foreign countries exporting eggs to the United Kingdom market were invited to limit their supplies, during the six months March 15 to September 14, to the figures

MARKETING NOTES

for the corresponding period of 1933. A substantial measure of co-operation was afforded by the countries concerned. Imports of eggs for the period mid-March to the end of August, 1934, were approximately 8,700,000 great hundreds as compared with approximately 9,000,000 great hundreds for the corresponding period of last year. The Governments of the countries concerned were recently asked to continue the standstill arrangement until the end of September, and proposals have now been put before them designed to effect a reduction of five per cent. in total imports of eggs from foreign countries during the quarter October-December, 1934, as compared with the figures for the corresponding quarter of 1933. The Governments have also been informed that it is desired to effect a ten per cent. reduction in the first quarter of 1935. Arrangements are being made to secure a reduction in imports from the Irish Free State. Discussions have been initiated with the other Dominions interested in the supply of eggs to the United Kingdom market.

The Cattle Industry (Emergency Provisions) Act, 1934.—The scheme for making payments under the Act came into operation on Saturday, September 1, 1934, the earliest date permissible under the Act. By the morning of September 1, over 600 Live-weight Certification Centres had been approved and a Certifying Authority appointed. These Centres included all the live-stock markets at which sales were likely to take place on September 1 and 3. In addition 25 Dead-weight Certification Centres had been approved. Further Centres have since been approved, bringing the totals up to 808 Live-weight Centres (including 69 in Northern Ireland) and 29 Dead-weight Centres, by September 15.

In the more remote and sparsely populated parts of Scotland difficulties were likely to arise in arranging for normal facilities for certification, owing to the absence of regular markets. The Cattle Committee have therefore made special arrangements under which the County Organizers in certain areas may certify animals in instances in which the producer cannot reasonably be expected to take his animals to an approved Certification Centre, i.e., when the distance is more than ten miles by road. These special arrangements apply only to live-weight certification. The detailed arrangements for certification will be made by the

MARKETING NOTES

County Organizer himself, according to the circumstances in his own particular area. In some instances the Organizer will announce definite centres and dates on which he will be available to examine animals, and in others it may be more convenient to make special arrangements for certification on a particular occasion. In such an event the County Organizer will undertake all the duties of a Certifying Officer and Certifying Authority.

Milk Act, 1934.—Milk for Schools.—Approval has been given to a scheme for the provision of milk in schools at reduced prices, submitted by the Milk Marketing Board under Section 11 (1) of the Act on the recommendation of the Advisory Committee on Milk Publicity. The scheme, which came into operation on October 1, makes it possible for milk to be sold to children or young persons attending full-time schools or courses recognized for grant by the Board of Education at $\frac{1}{2}d.$ for one-third of a pint, instead of $1d.$ as hitherto.

The scheme is being developed, with the voluntary co-operation of teachers, on lines similar to those hitherto followed by the National Milk Publicity Council. The milk can be supplied on seven days a week, and throughout the holidays, provided that arrangements can be made to assemble the children. Other proposals in regard to general publicity designed to increase the demand for milk are under consideration.

Cheese-Milk Price.—For the purposes of Sections 1, 2 and 3 of the Act relating to Exchequer payments in respect of milk—

(a) sold for manufacture,

(b) used for manufacture by Milk Marketing Boards, and

(c) converted into cheese on farms,

the Minister is required to certify the cheese-milk price for each month from April, 1934, onwards, and Section 4 of the Act defines this price as the excess over $1\frac{3}{4}d.$ of the average of the prices per pound at which cheese such as is commonly known at the commencement of this Act as "New Zealand finest white" and "Canadian finest white" was sold wholesale in Great Britain during the immediately preceding month. On August 29 the cheese-milk prices were certified accordingly as follows:—

April, 1934	.. ..	3.42d.
May	.. ..	3.40d.
June	.. ..	3.48d.
July	.. ..	3.75d.
August	.. ..	3.83d.

MARKETING NOTES

These prices were calculated by reference to the averages of the price quotations published weekly in the special Market Report of the London Provision Exchange.

Milk (Farm Cheese-Milk) Order, 1934.—This Order, which was issued on August 27, provides that no sum shall be payable to Milk Marketing Boards under Section 3 of the Act in respect of milk used by a registered producer in manufacturing cheese, unless the producer had in his possession not less than 8 milch cows at the beginning of the month in which the milk was used.

Milk (Evidence) Regulations, 1934.—Regulations prescribing the evidence that Milk Marketing Boards must produce in order to satisfy the Minister in regard to claims made by such Boards under Sections 1, 2 and 3 of the Act have also been made. Particulars will be given in the November issue of this JOURNAL.

Fat Stock—Sales by Grade and Dead Weight.—The Ministry of Agriculture's Scheme for the sale of carcasses of fat cattle and calves by grade and dead weight is now in operation at London, Birmingham, Leeds, Bradford, Birkenhead, Liverpool, Manchester and Sheffield, the last two centres having recently been approved for the purposes of the Scheme.

In addition to explaining the procedure to be followed under this method of sale, the relative leaflet (Marketing Leaflet No. 27) contains particulars as to Cattle Fund payments in respect of animals, the carcasses of which are sold on a dead-weight basis. At all the approved centres the Head Graders of the Ministry are the Certifying Officers in respect of such payments. Copies of Marketing Leaflet No. 27 may be obtained free of charge on application to the Ministry. Copies of Marketing Leaflet No. 46 (Fat Lambs and Sheep) and of Marketing Leaflet No. 63 (Pork and other Pigs) may also be obtained from the Ministry free of charge.

During the month of August, 277 cattle and 2,211 sheep and lambs were dealt with under the schemes, the totals to August 31 being 7,613 cattle, 29,518 sheep and lambs and 662 pigs.

National Mark Dressed Poultry Scheme.—The interest in this Scheme shown by poultry producers is increasing. 42 packers have been granted certificates of authorization and,

MARKETING NOTES

in addition, a number of prospective packers have been advised to adopt National Mark standards for their packs as a precedent to qualifying for authorization to pack under the National Mark scheme.

Following the steps taken by representative National Mark packers to co-operate in the development of a common sales policy, referred to in the January issue of the JOURNAL, the rules of the proposed National Mark Poultry Packers' Federation have been drawn up, and the society has been registered by the Registrar of Friendly Societies under the Industrial and Provident Societies Act, 1893.

For some months past a group of packers authorized under the National Mark scheme have been marketing their supplies of dressed poultry under a common private brand label in association with the National Mark. These packs have attracted considerable attention on the wholesale markets, have realized satisfactory prices and continue to be in good demand.

Marketing Demonstrations at Shows.—Marketing demonstrations will be staged by the Ministry at the following shows during October:—The Bristol and West of England Grocers' and Food Trades Exhibition—The Coliseum, Bristol, October 10-20; the London Dairy Show—Royal Agricultural Hall, Islington, October 23-26; and the Marden and District Commercial Fruit Show—Marden, Kent, October 24-25. The exhibits at the first two shows will demonstrate the various National Mark schemes, while at the Marden Show the display will be confined to apples, pears, tomatoes and cucumbers.

National Mark Shopping Campaigns.—National Mark shopping campaigns will be held in Nottingham from October 3-10, and in Bristol from October 10-20. In each city a representative Committee has made the necessary local arrangements. Suitable advertisements are appearing in the local press and local traders are making special displays of National Mark commodities. Shop window dressing competitions, open to retailers stocking National Mark products, film displays for housewives and senior school children, and essay-writing competitions for the children have also been arranged.

A special feature of the Nottingham campaign will be a display of National Mark products in suitable premises in

MARKETING NOTES

the city. A similar display will be staged at the Bristol and West of England Grocers' and Food Trades Exhibition.

A New National Mark Recipe Book.—During October, the Ministry will publish a new booklet containing recipes for using National Mark eggs, poultry, beef, salads, flour, and fresh, canned and bottled fruits and vegetables. These recipes have been contributed by three well-known experts:—Mrs. D. D. Cottingham Taylor (Director of the *Good Housekeeping* Institute), Mrs. Emelie Waller (well-known for her broadcast talks on cookery), and Mr. Ambrose Heath (author of "Good Food," etc.). The Minister has contributed a foreword to the booklet, which is intended as special propaganda for the National Mark movement.

A Competition for New Designs for National Mark Labels.—Acting on the advice of the Council for Art and Industry, which was appointed by the President of the Board of Trade in January last, the Ministry has arranged a competition for designs for National Mark labels, in conjunction with an exhibition of labels and label designs for fresh, canned and bottled English fruits and vegetables, jams and cider made from home-grown fruit, and honey, which it is hoped to stage at the Imperial Fruit Show, Leicester, November 2-10. The competition is divided into three sections:—Section I for National Mark labels issued by the Ministry; Section II for private brand labels incorporating the National Mark; and Section III for small tie-on labels used on containers for certain kinds of fresh fruit and vegetables.

The judges will be appointed by the Council for Art and Industry and prizes will be awarded by the Ministry in each section. The closing date for the submission of designs is October 20.

The Ministry has also commissioned eight well-known artists to execute designs for National Mark labels. These designs, as well as specimens of well-designed labels in use in the Empire and foreign countries for similar products, will be included in the exhibition.

Flowers and Plants Publicity Committee.—A special propaganda leaflet, describing the work of this Committee, has been prepared by the Ministry, primarily for circulation to the members of the branches of the horticultural industry

MARKETING NOTES

concerned with the production and marketing of home-grown bulbs, roses, trees and shrubs. Any organization or person who may be interested may obtain copies, free of charge, from the Ministry of Agriculture, 10, Whitehall Place, S.W.1.

Arrangements have been made with the B.B.C. for a broadcast talk on the cut-flower industry in December.

A revised edition of the list of British bulb growers and distributors, which was previously prepared by the Empire Marketing Board, has been published by the Ministry and circulated to local authorities and others likely to be interested.

Northern Ireland: Control of Sales of Bacon Pigs by Pigs Marketing Boards.—The Northern Ireland Pigs Marketing Board has recently announced its intention to take over the live pig trade in Northern Ireland. The object of this decision is not only to stabilize the live pig export trade—which is likely to assume considerable proportions during the coming autumn—but also to ensure adequate supplies of good-quality pigs for any “Wiltshire bacon” factories that may be set up in Northern Ireland.

When the Board assumes control, all live bacon pigs will be sold to the Board with the exception of those sold on contract to curers of “Wiltshire bacon.” The trade in suckers, store pigs, fat sows and boars, and breeding stock will not be affected.

Except in the Belfast area it is proposed that the Board shall buy through the Farmers' Associations formed at its request by the Ulster Agricultural Organization Society. Pigs will be paid for on a live-weight basis, and weighing facilities have already been arranged for at many collecting centres where they did not exist. Buying prices will be comparable with dead pig prices, as prescribed by the Board, or in certain cases with Wiltshire pig prices. Pigs will be classed as First or Second Grade shipping pigs, or as pigs unsuitable for shipping, and payments will vary accordingly.

Pigs purchased by the Board, if not sold in Northern Ireland, will be sold in Great Britain or elsewhere. For the export trade selling agents have been appointed and transport and insurance terms have been arranged. Any loss incurred by the Board in exporting live pigs will be

MARKETING NOTES

recouped by a special trading levy on all pigs sold by Northern Ireland producers, and any profit will be distributed over all pig producers in proportion to their sales.

Irish Free State: Slaughter of Cattle and Sheep Act, 1934. —A far-reaching measure to deal with the crisis in the live-stock industry has recently been passed in the Irish Free State. Its object is to secure the absorption of the surplus of cattle that has resulted from the contraction of export outlets, and has brought the returns of producers to very low levels.

In order to secure a better equation between internal and external prices the Minister for Agriculture has taken powers to fix minimum prices payable in respect of cattle and sheep slaughtered for internal consumption. To render such fixation of prices effective the Minister is empowered, on the one hand, to regulate by order the rate of slaughter of cattle and sheep and, on the other, to extend the market outlets for slaughtered stock. The stimulation of market outlets will take the form of distributing fresh beef free of charge on a voucher system to necessitous persons, and, if necessary, by giving financial aid to the development of a preserved meat industry. The funds necessary for this part of the policy will be derived partly from a levy on cattle and sheep slaughtered for home consumption.

The main administrative provisions are that the slaughter of cattle and sheep, and the distribution of fresh meat derived therefrom will be confined to premises registered by the Minister. The registration of meat distributors will provide machinery for ensuring the payment of minimum prices for cattle and sheep and will be of assistance in administering that part of the Act relating to the distribution of free beef to necessitous persons, which, it is understood, will be brought into operation experimentally in the immediate future. Registered proprietors of registered premises will be responsible for paying the prescribed minimum prices, calculated on a weight basis or otherwise, for the stock slaughtered and for the payment of levies. If at a prescribed minimum price the available outlets for fat stock prove insufficient to absorb the supply the Minister may take steps to correct the flow of supplies. His inspectors may visit farms and mark cattle on the farms in such a way as will indicate the earliest date at which such cattle may be slaughtered. It will be an offence for

MARKETING NOTES

any person to slaughter either unmarked cattle or any marked cattle at a date before that indicated by the mark. It is contemplated that the compulsory carry-over of cattle from the autumn to the spring in order to equate home supply and demand will be effected in this way. Provision has also been made for extending this part of the Act to sheep, should this prove necessary.

It has been realized that the provision of free beef and the regulation of rates of slaughter may not be sufficient to balance home supplies and demand and provision has been made, under the control of the State, for diverting surplus cattle to the meat manufacturing industry. The Minister may prohibit the export of cattle and sheep and the manufacture of preserved meats from them except by licence. He may foster the development of the meat-packing industry, and the State is empowered to enter the live stock and meat manufacturing trade both in the home and export markets. This vertical control of the cattle and sheep industries is considered necessary for regulating the flow of supplies as between various outlets and thereby ensuring that the prescribed minimum prices are maintained.

The annual cost of the programme is estimated at about £600,000, of which £400,000 will be absorbed by the provision of free beef. The levies on slaughtered cattle and sheep, which may be in the neighbourhood of £1 per head for cattle and 5s. per head for sheep, are expected to realize about £300,000 per annum.

Canada: Natural Products Marketing Act.—An account of the Natural Products Marketing Bill, which was read for the first time on March 26, 1934, was given in this JOURNAL in June, 1934 (p. 284). The Bill was passed by the House of Commons of Canada in an amended form on June 7, and after consideration in the Senate, received assent on July 3. The amendments which have been incorporated are summarized below and cover a number of important points in both parts of the measure, though the basic principles of the Bill remain unaltered.

The definition of "natural product" now includes "animals, meats, eggs, wool, dairy products, grains, seeds, fruit and fruit products, vegetables and vegetable products, maple products, honey, tobacco, lumber, and such other natural products of agriculture and of the forest, sea, lake or river, and any article of food or drink wholly

MARKETING NOTES

or partly manufactured or derived from any such product that may be designated by the Governor in Council, in accordance with the provisions of this Act."

The Governor in Council may not now finance the Dominion Marketing Board from the Consolidated Revenue Fund; he may only pay to the Board such sums, from moneys appropriated by Parliament, as are necessary to assist in the organization of local boards and to defray the direct operating expenses of the Board and any authorized expenses incurred in administering the schemes initiated by the Minister.

The marketing powers of the Board have been amended in some respects. The Board is now explicitly authorized to designate the agency through which the regulated product may be marketed; and also to operate a pool for the equalization of returns from the sale of the regulated product. Certain limitations have been placed on the Board's powers to compensate producers. No compensation may now be paid in respect of losses due to the withholding of a regulated product from a particular market in consequence of quality standards set by the Board or of import restrictions in other countries. The powers that the Dominion Board are authorized to confer on local boards are limited to powers that are granted to the Dominion Board and are necessary for the proper enforcement of the scheme; and the Board is no longer authorized to hold property.

The powers of the Board relating to the collection of levies, etc., and to the administration of its funds, are defined in greater detail, particularly as regards its relations with local and provincial boards or agencies.

The provisions for the initiation and revocation of schemes have been amended considerably. If a poll is proposed in the scheme, the arrangements for it must be specified. The Minister may require a poll to be taken on a scheme and may fix the percentage of votes in favour required to warrant its further consideration, before he finally recommends the approval of the scheme by the Governor in Council. If such a poll has been taken, a scheme cannot be revoked subsequently without a poll, and the Minister will again fix the percentage of votes required to secure the revocation.

The Board is required to submit an annual statement of its affairs to the Minister, who in turn is required to submit it to Parliament.

Investigations may cover wages in addition to prices and margins; but the earlier provision enabling a committee of investigation itself to determine whether the "spread" involved in marketing and manufacturing processes is detrimental to the public interest has been modified. Instead the committee will report any findings of this kind to the Minister. Reports are to be made public unless the committee advise against it, in which case the Minister may exercise his discretion.

Two new clauses deal with the legal procedure to be followed where an excessive spread is alleged to have been received or demanded. These are designed to give provincial authorities the first opportunity of instituting legal proceedings in connexion with offences alleged to have been committed within their area of jurisdiction and to give the defendant certain rights of option as regards the judicial procedure to be followed. The Minister is required to report annually to Parliament on all proceedings taken under this part of the Act.

An important new clause provides that, if it is found that Parliament have exceeded their powers in the enactment of any provisions of the Act, none of the other provisions shall therefore be held to be inoperative or *ultra vires*.

OCTOBER ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington.

OCTOBER is one of the months in which there is definite evidence of the ending of one farming year and the beginning of another. This is particularly true of arable farming areas under normal conditions, for root harvesting makes headway and the active preparation of land for next year's crops takes place. In a sense there is also a definite break in the farming practices in grassland areas. One cannot expect much effective growth during October, and therefore the problems of winter have to be faced with the stocks of food and reserves of grazing that already exist. Over the greater part of the country there is need for the exercise of the strictest economy in the use of home-grown foodstuffs, and it is desirable that this should be appreciated at the beginning of the winter rationing period rather than half-way through. This does not mean that stock should be half-starved, but rather that by the exercise of ordinary care waste should be studiously avoided. It is surprising how effective careful rationing of home-grown food supplies can be in preventing the early disappearance of hay, forage and roots.

October is often a pleasant month climatically. There is a gradual reduction in the hours of bright sunshine, though the drop is very much more marked in November. In ordinary circumstances there is a fairly high rainfall, and upon the amount of this depends the progress of arable operations. This year the ground will be able to absorb a relatively large rainfall without causing undue inconvenience to arable work. The appearance of early frosts is quite a normal expectation, especially towards the end of the month, though it is unusual to experience severe frosts until November. Frost has a special bearing on root harvesting. It is important that mangolds should not be handled if they are frosted, since their keeping qualities are likely to be affected. There is always a temptation for men lifting the crop on piecework to disregard this, but it is an important point. The keeping qualities of roots are frequently affected by too early lifting, especially following a dry period. This is particularly true of mangolds, while

OCTOBER ON THE FARM

it was observable last year that potatoes lifted before the weather broke were inclined to be leathery and of poor quality. An improvement in quality occurred after the rain had fallen. Lifting after a dry period is therefore not always a straightforward business, for on the one hand there is the danger of lifting too early, while on the other delay courts the risk of frost damage.

For general work, October is a very busy month. Root harvesting and wheat sowing are more or less inter-dependent, since wheat so often follows potatoes, mangolds, and sugar beet. A good deal of autumn work has already been done on many farms, as a consequence of the early harvest. This is particularly seen in the cleaning out of cattle yards and the application of farmyard manure to the pared stubbles. Incidentally, this may be regarded as desirable practice in most cases, for though there may be some loss in nitrogen content if a mild wet winter follows, there is always the satisfaction of having completed the work with the minimum expense in horse and man labour. Economically, this is the most important factor.

Farming against Drought.—Two consecutive years of low rainfall may suggest the possibility of a cycle of dry years. We all know that the weather has always been one of the principal uncertainties in farming, but it is desirable to examine the future of farming practice in the light of recent experiences which have led to the modification of many established ideas. Thus a farming system developed under conditions that demand a reasonable rainfall can be very much disturbed by persistent droughts. One dry year appearing occasionally has always been a normal experience, but quite different problems arise when two such years follow each other. In looking back over the events of the past two years it is evident that where a system of farming has been planned to cope with drought conditions, a measure of success has attended these efforts.

The behaviour of farms under drought conditions varies greatly. Soil factors and residual fertility have an important bearing on the continuity of growth in the absence of normal rainfall. The response of crops is similarly different, but farms that are well balanced in respect of grass and arable, and at the same time are suitably mixed in regard to the live stock carried, are likely to be more stable economically than where specialization

OCTOBER ON THE FARM

in one branch of farming is carried to extremes. In visualizing the possibility of drier conditions, it is probable that a new interest will attach to the arable side of farming, even on farms of average size. At the time of writing grass land in the Eastern Midlands is still parched and bare. Succulent growth is absent, and in consequence conditions for the maintenance of live stock are very similar to winter. The cost of maintaining stock is very much higher than in a normal year, and it is only where a sufficient supply of home-grown forage crops exists that any satisfaction is to be derived from the present experiences.

It is sometimes suggested that a farming policy that depends on soiling crops is not an economic one, owing to the relatively high labour costs. The writer is still convinced that in dairy farming there is a wide field for a more extensive use of forage as a supplement to grass land, particularly as a form of insurance against droughts and as a means of increasing the productivity of land. In determining the cropping for next year some thought should be given to this aspect, especially on soils that are on the light side and therefore naturally inclined to burn. It may even be worth while to consider a seeding of rye or rye and tares for feeding in late April and early May, as a means of giving grassland a little longer to establish spring growth sufficient for the needs of the live stock. It has been fairly obvious this year that pastures stocked very early have never recovered or produced the degree of growth that has been experienced with fields that were rested for a longer period.

Of the crops of a more permanent kind that have proved particularly valuable this year lucerne is perhaps the most successful. Lucerne might be regarded in a more favourable light if it were more frequently associated with mixed grasses—which definitely remove a common difficulty of maintaining ground cropped with lucerne free from weeds. The possibility of setting aside an area for lucerne must be considered when planning next year's seedings.

Of more immediate concern, however, are seedings that will serve the needs of green summer feed if required, or for utilization as silage or hay. A cereal-legume mixture is a valuable asset in mid-summer for any purpose that may arise, and although seedings are frequently left until late winter or early spring, autumn seedings are usually more effective, especially if a very dry spring and summer are

OCTOBER ON THE FARM

experienced. A basal mixture consists of 2 bushels of winter oats and $1\frac{1}{2}$ bushels of tares. In many instances the inclusion of beans is regarded as a definite improvement, partly because the mixture is strengthened and is therefore more easily cut.

It is commonly assumed that forage or soiling crops require little or no manure. This is far from the fact. The failure to attend to the manurial requirements of land cropped in this fashion in many cases explains the resulting disappointments. As a basis, farmyard manure is particularly valuable, in fact in framing a farming system against the possibility of drought an abundance of "muck" is an invaluable asset.

Wheat.—Largely as a result of the operation of the Wheat Act, wheat has assumed the role of the most important home-grown cereal. In this respect it has gradually taken the place of oats. Suggestions are sometimes made that the English climate is not an ideal one for this crop, whereas with ordinary good management wheat is the most fool-proof of our cereals. In many branches of farming it serves special functions that make it almost indispensable. Thus the importance of the crop is not determined entirely by the value of the grain produced, though the present prices with the added deficiency payments generally leave a satisfactory margin of profit. The straw, however, is required for thatching and for litter, and this aspect must not be overlooked in estimating the profits of wheat growing. For rich soils, one can select stiff-strawed varieties that are not so apt to lodge as barley or oats, and therefore reduce the cost of harvesting, while ensuring more successful takes of grass and clover seeds.

The factors that determine successful wheat production are many. Carslaw of the Cambridge University Farm Economics Branch has arrived at a net cost of production of just over £8 per acre, as a result of examining costings data from farms in the Eastern Counties during the years 1930 to 1932. The average yield over 3,244 acres was just under $4\frac{1}{4}$ quarters of saleable corn, which, according to the standards of good farming, is not particularly high, but is nevertheless quite an average figure. The possibility of increasing profits by a reduction in the cost of production is probably best realized by the mechanization of the cultivation and harvesting operations. There is, however,

OCTOBER ON THE FARM

only a very limited scope for mechanization on farms of average size, and therefore under the more intensive forms of farming the real aim should be in the direction of increasing the yield of grain per acre.

The extent to which the farmer can influence the yield of grain by good management is already reasonably well defined. A combination of good fertility with appropriate seed-bed preparation is a fundamental necessity. A well-drained soil, suitably manured or rich in fertility and with a seed-bed that is firm underfoot, provides the ideal basis for a successful crop of wheat. Failures frequently arise on the lighter types of soil through lack of firmness in the seed-bed—a condition that is often experienced after ground has been cropped with potatoes. The old-fashioned furrow press had much to recommend it for imparting solidity to the ground in such circumstances, and this point will deserve special attention in the present season after the dry summer. Many wheat crop failures last year were due to hollow soils.

The influence of variety on yield is very often determined by the ability of the variety to stand up to conditions of high fertility. Lodging not only interferes with the quality of the grain but also seriously affects the yield. The best varieties from the viewpoint of strength of straw are Yeoman and the Swedish varieties, Crown and Steel. These three varieties are very popular in the Midlands, especially where intensive forms of farming are practised.

Since the determination of profits is often dependent upon the fact that the sample must be suitable for milling purposes when deficiency payments are claimed, it is desirable to observe the necessity for sowing grain that has been treated against bunt. There is no legitimate excuse for growing bunted wheat in these days, particularly since the various powder treatments for the grain are so cheap and effective. It is an interesting fact, however, that a large number of farmers still use the copper sulphate treatment, even though this is more apt to interfere with the germination of the grain.

As regards the effect of manures, nitrogen has a dominating influence on yield. Much depends on the place in the rotation as to the need for added manures. In Carslaw's wheat costings very little added artificial manure was given. There is always the fear of overdoing the crop, thereby encouraging the tendency to lodge. Where the

OCTOBER ON THE FARM

previous treatment of the land has not built up a reserve of phosphates and potash, however, phosphates are particularly useful in stimulating root development, especially after a wet winter, while potash is undoubtedly an asset in a dry year, promoting continuous growth and the production of plump grain. In most seasons the nitrogenous needs of the crop can be most satisfactorily met from spring applications. In the present season there should be ample reserves for early growth requirements.

There is no unanimity as to the best quantity of seed to sow. Carslaw gives the averages as 2.2 bushels per acre on fen soils, 2.3 bushels on the clays, and 2.5 bushels on the light-medium soils. It is an interesting fact that light seedings of wheat are usually more satisfactory on the typically heavy land wheat soils than on lighter soil types. This was frequently observed in the days when the Midland College had two farms on different soil formations. On the present farm, 3 bushels per acre are regarded as a minimum seeding if a satisfactory plant is to be secured. This, however, is on a light or gravelly soil.

NOTES ON MANURING

F. RAYNS, M.A., and E. T. SYKES, M.A.,
Norfolk Agricultural Station.

THE comparative indifference of farmers towards the use of artificial manures has been indicated in a number of economic surveys of British farming.

While the more progressive farmers fully exploit artificial manures, it is pointed out that the great majority do not, and so have failed to interpret the lessons of our Experimental Stations, notably those of the classical fields of Rothamsted.

This indifference is doubtless largely a reflection of the attitude of some farmers towards the agricultural educational facilities of this country, for no man can possibly fail to have confidence in manuring if he thoroughly understands its principles. If he does not understand them his technical education has been neglected.

As long as this matter is ignored there will be those who see something insidious in "bag" manure; men who put on a little superphosphate when the sulphate of ammonia runs out; men who see some subtle and essential difference between the compound manure and the straight ingredients from which it is compounded; men who, in consequence, never know what to buy or why they buy. Perhaps complete indifference is to be preferred to that frame of mind; yet the latter exists all over the country, and merits publicity here because it is one of the most potent reasons for the low returns from many farms.

Ignorance of the elementary principles of manuring is often shown by the use of practically nothing but sulphate of ammonia, or some other quick-acting nitrogenous manure, especially when nitrogen is cheap, as it is at present. Effects of nitrogen are quickly observable; there are distinct colour changes and usually an obvious quickening in the growth of the crop. Everything seems satisfactory. For a year or two yields are not reduced; there is probably an adequate reserve of phosphate and potash from previous manuring to carry the crop on, but cropping difficulties arise sooner or later and yields become less. The muck cart, the sheep folds, and the remainder of the manuring must always be directed towards the general

NOTES ON MANURING

improvement of the holding; then crop failures will be reduced and yields will attain and maintain a higher level.

A Policy of Manuring.—Much disappointment would be avoided if farmers decided on a manuring policy and, once it proved satisfactory, varied it as little as possible each year—and then only according to the variation in the unit prices of the source of nitrogen, phosphate and potash respectively.

Under such a policy manuring might become standardized, if there are no violent cropping changes, and the cost per acre will not vary appreciably.

For instance, the manuring of the Sprowston farm of the Norfolk Agricultural Station, which is worked on a five-course rotation of wheat, barley, sugar-beet, barley, hay or potatoes or vegetable crops, will cost about 13s. per arable acre next year. An East Anglian arable farm still adhering closely to the four-course system of farming, without growing sugar-beet, would cost almost exactly 10s. per acre if the same principles were followed; in fact 10s. per acre ploughed may be taken as a standard of comparison for East Anglian arable farms for the coming year. A very well-farmed Norfolk farm cost 12s. 5d. per arable acre in 1933 and 13s. 5d. in 1932. There the annual cost of manuring is more than the rental value of the land, but the farmer has weathered the depression and the farm is not derelict—sufficient testimony to the soundness of the policy, including the manuring, to disarm all reasonable criticism.

The above costs of manuring do not, of course, apply universally. The system of farming controls the cost of manuring to an appreciable extent. Yet the calculation is worthy of being made by every farmer. It will enable him to compare his manuring budget with that of his neighbour and serve to check his expenditure on manures from year to year.

As we have suggested a definite policy it may perhaps be interesting to summarize the manuring of the rotation at Sprowston, omitting the potatoes and vegetables.

The wheat after hay receives farmyard manure, after potatoes nothing, and is top-dressed in the spring if necessary; the succeeding barley is given a mixture of 2½ cwt. superphosphate, ¼ cwt. of 30-per-cent. potash salts and ¼-1 cwt. of sulphate of ammonia, per acre; sugar-beet receives farmyard manure and 8 cwt. of artificials per acre, this quantity including 3 cwt. of 38-per-cent. superphosphate, 2 cwt. of 30-per-cent. potash salts, and 3 cwt. of sulphate of ammonia, and the beet are not top-dressed; barley after beet is not manured, but half the beet tops are ploughed in or sheeped; the hay is not manured.

This manuring, with improved cultivations, has raised the yields of the two chief crops, barley and beet, from 4 qr. and 8 tons per acre—as they respectively were one year after the farm was taken over—to the present general

NOTES ON MANURING

average of $5\frac{1}{2}$ qr. and $11\frac{1}{2}$ tons per acre. The system of manuring is only likely to vary in the future if prices fluctuate; the principle is established, as it can be established on any farm. As such a policy emerges in a definite form there is less need to experiment, and changes in manuring will only arise in emergencies—as in case of insect attack or after a particularly cold wet spell in the spring, when extra nitrogenous manure would probably be used.

These, however, are exceptional instances, and while it would be unwise to advocate a comatose attitude towards manuring progress it is extremely desirable to maintain continuity in practice, and to test alternatives only on a small and simple scale, preferably under the guidance of a specialist. It is easy to waste money through misdirected enthusiasm. British farmers have a free agricultural advisory service, and many of them make no use of it; yet the use of it often saves money, although it may necessitate an increased outlay on manures.

This standardization according to crops is contrary to the tenets of those who advocate the consideration of each field on its merits and thereby introduce slight variations in the manuring of each crop on different fields of the same farm. We must, of course, be influenced by extreme variations in soil types that do occur on some farms, but if we consider fairly uniform soils, is our knowledge of manuring so very precise that such differentiation is really justified? Until satisfactory methods are devised for the analysis of the soil, and the requirements of the crop, so that we can by subtraction ascertain accurately which manures to apply and in what quantity, there can be no more precision in deciding on the manuring of a field than there is in estimating the height of an aeroplane by eye.

As the land improves in condition, failure of the corn crops to stand up till harvest, and perhaps lowered quality of the barleys, may necessitate some slight but permanent modification. This may lead to the introduction of new and better-standing varieties, and to slightly reduced manuring.

Autumn-sown Two-rowed Barleys.—The two-rowed barleys are now frequently sown in the autumn in favourable districts, where they are known as “winter” barleys. They are not true winter barleys (which have six rows of grain) but are referred to here as winter barleys for con-

NOTES ON MANURING

venience. Nevertheless, it is not unlikely that the manuring of autumn-sown two-rowed barleys would apply equally well to six-rowed barleys.

Prime malting quality is usually expected in two-rowed barleys and since these must be sown in October or early November, they are not often grown after a root crop. Winter barleys must usually be taken after another cereal—at a place in the rotation, in fact, where condition is temporarily low. Thus the manuring must be more liberal than is safe for spring barleys; there is less risk of the crop going down, and since the rigour of the winter and the washing by the winter rains must be withstood, winter barley is likely to respond markedly to nitrogenous top-dressings in the spring.

As a rule, at least 1-1½ cwt. per acre of a nitrogenous manure may be safely employed in the spring, and where winter barley follows another corn crop growers of repute are unanimous that some form of phosphate manuring is necessary in the autumn, as well as potash on the chalky soils. They are not, however, unanimous regarding the kind of phosphatic manure: some believe that it should be of organic origin like meat and bone meal; others are equally certain that the inorganic phosphates—like superphosphate and basic slag—are not only cheaper but are just as effective.

This view is supported by some Norfolk experiments made in 1931. Perhaps the most interesting comparison was between meat and bone meal and a combination of superphosphate and sulphate of ammonia, the former being applied to the seed bed and the latter as a spring top-dressing. The meat and bone-meal treatment produced less barley, took three days longer to ripen, and grew less straw, than the superphosphate and sulphate of ammonia dressing. The general response to manuring was an increase of about 15 per cent. A high-grade meat and bone meal was used, and equivalent quantities of nitrogen were applied in the two forms, the sulphate of ammonia being applied in the spring. The valuers placed the barley grown with meat and bone meal slightly higher than that from the superphosphate and sulphate of ammonia treatment, and the nitrogen contents confirmed their views. The analyses were 1.56 and 1.65 per cent. of nitrogen respectively. The higher nitrogen content of the barleys grown with sulphate of ammonia, the six inches of extra straw that was produced, and the increased yield of grain, suggest that the organic nitrogen was not fully utilized by the crop during its growth, and that there was little advantage to be gained from a seed-bed application of the slow-acting nitrogen in the meat and bone meal. It should be added that the experiments were made in a district where the mean annual rainfall is about 25 in.

It is important to remember that our knowledge of the manuring of barley is largely the result of experiments with spring barleys preceded by a root crop. The condition of

NOTES ON MANURING

the land after roots is as high as it is likely to be during the rotation, and the great fears of the malting barley grower, viz., a high nitrogen grain content or a laid crop, can easily materialize from incorrect manuring. The experience of several years' cultivation of winter barley in East Anglia shows that there is much less danger of overmanuring spoiling the sample than in the case of spring barley.

In addition to spring top-dressings of nitrogenous manures winter barleys on almost all soils should be dressed with 4 cwt. superphosphate per acre or an equivalent quantity of basic slag or other phosphatic manure. On the light soils and chalks 1 cwt. of 30-per-cent. potash salts or its equivalent in some other form of potash should be added.

Autumn Applications of Nitrogen.—Manuring for wheat after wheat or another cereal is an entirely different problem from manuring for wheat in the usual place after a seeds ley, beans, potatoes or a bare fallow.

Where wheat follows a one-year seeds ley it is usually given farmyard manure; after potatoes or beans it often receives nothing until the spring, when a top-dressing may be given. After another cereal the reserves of readily available plant food in the soil are likely to be small, and more attention must be paid to the manuring. Wheat, with its deep-rooting habit, responds more to phosphate and nitrogen than it does to potash, except on light soils. The phosphate or potash must, of necessity, be applied in the autumn, but when should the nitrogen be applied? The answer is particularly important to those who grow wheat out of shift, when the wheat must be done unusually well. Now, although it is generally recognized that wheat responds markedly to nitrogenous manures, the best time to apply the manure has not yet been determined. As Doughty, Engledow and Samson remark in the *Journal of Agricultural Science* (July, 1929), there is a critical period in the growth of field crops of wheat which occurs some time during March. Before that time wheat crops of all plant populations tiller to the same extent; after the critical period density of plant affects tillering. More important still, tillers formed after the critical period do not bear ears. If by some means it is possible to increase the number of tillers before the critical period the number of ears harvested would be greater, and provided there is no reduction in the size of ear, harvest yield should be increased. They state that

NOTES ON MANURING

if nitrogenous top-dressings are to increase yields by augmenting the number of ears per plant they must be available to the plant before the critical period of tiller formation. On the other hand, applications too late to affect ear formation may influence ear size and thus increase yield.

In *Agricultural Research in 1928*, Sir John Russell puts it slightly differently. In regard to nitrogen supply he recognizes two phases in the growth of wheat: the first before ears are formed when roots develop and tillers form, and the second after tillering finishes and heads develop. A considerable amount of work is going on regarding the spring applications of nitrogenous manures to wheat and it will perhaps be best to defer further comment.

In the meantime, it may be useful to examine briefly the more seasonal hypothesis that yields might be further increased by causing the plant to form more tillers and subsequently more ears by using two top-dressings—one in December and one in February. For practical reasons a December dressing would hardly be possible on heavy land, but there is no reason why some nitrogenous manure should not be applied to the seed-bed of any wheat crop—unless it is the fear of producing a “winter-proud” condition, or of losses of nitrogen from the winter rains. Such fears are not likely to daunt the man who is taking a second successive wheat crop or wheat after barley or oats.

In 1928, 1929 and 1930 experiments were carried out by the School of Agriculture, Cambridge, and the Norfolk Agricultural Station, and a total of $1\frac{1}{2}$ cwt. of sulphate of ammonia was applied to wheat in two doses, half at the end of November and half during February, and the effects were compared with those produced by $1\frac{1}{2}$ cwt. applied in one dressing in February. Actually, the end of November or early December was the time when the crops were just coming up, so the first dose went on at brairding. The results may be stated shortly.

The yield increases were variable, the average increase in each of the three years being 6, 1.6 and 4.5 bushels respectively; there was no significance between the yield differences of the two times of application. Moreover, developmental studies showed that there was also no difference in either the numbers or size of ears at harvest. It does not, therefore, seem possible to influence tillering by very early applications of nitrogenous manures; nor in consequence does it seem possible to increase the number of ears by the same means. It is, however, possible to increase ear size by autumn application, although there is apparently no advantage in doing so. Considering all aspects it is best to wait until the spring, for then every benefit that has so far been derived from these autumn applications of sulphate of ammonia can be obtained without the slight risks that accompany them.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended September 12				
	Bristol	Hull	L'pool	London	Cost per unit at London
Nitrate of soda (N. 15½%) ..	£ 7 12d	£ 7 12d	£ 7 12d	£ 7 12d	s. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20.6%) ..	6 16d	6 16d	6 16d	6 16d	6 6
Calcium cyanamide (N. 20.6%) ..	6 16s	6 16s	6 16s	6 16s	6 7
Kainit (Pot. 14%) ..	3 0	2 14	2 12	2 14g	3 10
Potash salts (Pot. 30%) ..	4 11	4 7	4 4	4 2g	2 9
" " (Pot. 20%) ..	3 12	3 6	3 3	3 6g	3 4
Muriate of potash (Pot. 50%) ..	7 4	6 17	6 12	6 9g	2 7
Sulphate " " (Pot. 48%) ..	8 3	7 18	7 12	7 11g	3 2
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26.27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16k	3 6
" " (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	..	6 17	6 15f	6 7	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 12	5 12	5 10f	5 10	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. B. MERCEP, M.C., B.Sc. (Principal), and Colleagues,
Cheshire School of Agriculture, Reaseheath, Nantwich.

It is characteristic of farming that, whether times are good or bad, there is always an enthusiastic band of amateurs anxious to turn professional—a sort of territorial army straining for enlistment in the regulars. “I have about three acres of land attached to my house in the country, and though I work in the town at present, I have had some experience in pig breeding. I am thinking of developing a small pig farm and should be glad of your advice on the project.” Thus, for instance, a recent correspondent.

The Amateur turned Professional.—In days gone by, nine inquiries out of every ten of this nature could be answered safely and charitably, if somewhat cavalierly, in the language Mr. Punch adopted when tendering advice to those about to marry—“don’t.” Pressed for reasons, one could point to the violent fluctuations in prices, the difficulties of housing and so forth; but the fact that some men contrived to carry on in pig farming from year to year was a little difficult to explain away (save by the argument of the pedlar who lost on every brush he sold but managed to live because of his big turnover). In general, however, the manifest difficulty of finding markets quite rightly and properly settled the matter.

What is the answer to this particular proposition to-day? Assuming that the facts are as stated, is there any reason why a keen amateur should not turn professional pig breeder and feeder? Granting that the Pigs Board will manage to stabilize prices at a level that will leave a reasonable margin of profit to the producer, might not the small specialist pig farmer become as truly an integral part of the agricultural community as the specialist poultry farmer? Pig-keeping is not a necessary cog in the machinery of the general farm. It is always a department in itself, and on most farms it derives little indirect benefit from other sections. The Scandinavian feeding house, which can be erected almost anywhere, is more efficient than most of the existing piggeries on English farms. By-products of the general farm—particularly skim milk and whey—are admittedly a

NOTES ON FEEDING

cheap source of food on certain farms, but the bulk of the pigs in the country are undeniably fed on purchased materials.

The most difficult problem of the amateur is, indeed, not by-products to feed to the pig, but by-products arising from the pig. In this respect, occupiers of agricultural holdings are fortunate: on paper at least they command efficient drainage systems, and anyway their isolated position makes their drainage problem a personal matter. An occupier of a country cottage with three acres of land, however, cannot rely on his neighbours' complacency when pig-keeping is in question—for there is something about pigs in large numbers that commands general attention if not respect.

Autumn Feeding of Cows.—Autumn milk provides an exception to the general rule that the higher yielders are the more profitable cows in the herd. In the north-west, practical farmers are almost solid in the belief that high-yielding cows must be brought in early to winter quarters and winter rations. Our own experience at Reaseheath entirely supports this belief. Whether there be pasturage or not—this year there is not—the “season of mists and mellow fruitfulness” should see new calvers housed. In recent years, kale has come to be regarded as the great stand-by for the dairy herd in autumn. It is a cheap crop to grow, and ordinarily can be counted on to yield 18 or 20 tons to the acre. This year, unfortunately, crops on many farms are very small, and the milk producer has had to choose between two evils—that of sacrificing a light crop or that of heavy purchases of artificials. Most farmers, one may opine, have chosen the former alternative. In productive years, there is a tendency to over-feed kale. It is best used in rations of 20 to 30 lb. per cow per day. Big rations are apt to cause scouring (we attempted once to feed for 2 gal. on kale and hay only, but had to give it up as the cattle scoured so badly). It is advisable to keep back some kale for January or February feed, if this can be managed.

The Feeding of Poultry.—There is fairly general agreement among farmers as to suitable foods and feeding standards for farm live stock such as dairy cows, horses, sheep and pigs. This is probably mainly due to the greater attention paid by scientists to the nutrition of the larger animals, the pioneer work of Kellner in Germany having

NOTES ON FEEDING

been well followed up in America and in this country. The results appear in several standard text books on animal nutrition, in the Ministry's Bulletin "Rations for Live Stock," in numerous publications of the various agricultural colleges, and elsewhere.

Thus it may be said that the foundations of the scientific rationing of farm live stock have been well and truly laid: the main principles and feeding standards laid down, well supported as they are by experimental evidence, now meet with fairly general acceptance.

Not so, on the other hand, with the feeding of poultry. This is a subject surrounded to-day by much controversy, and still supporting several quite distinct schools of thought.

No doubt the main reason is that until fairly recently the amount of scientific work on poultry nutrition was comparatively scanty. The work presented difficulties not met with in the study of digestibility coefficients with other farm animals, the chief one being due to the fact that in the bird both urinary and faecal excrements are voided together, this making it hard to distinguish between digested and undigested residues.

Largely owing to the work of Katayama in Japan these difficulties have now been overcome, and methods of determining the digestibility of foods by poultry have been developed successfully so that tables showing these figures are available.

The whole subject of poultry nutrition is being taken up systematically in this country at the National Poultry Institute, the main principles so far established being outlined in the Ministry's Bulletin No. 7, "The Scientific Principles of Poultry Feeding."

Rations for Growing Chicks.—It is fairly safe to assume that the growing chick should be allowed food *ad lib* from the day of hatching until it reaches maturity as a producer of either eggs or meat. The main question to be settled is that of the *quality* of its food during these stages of growth. This question has been well studied at Cambridge, and the conclusions together with suggested feeding standards have been set forth in the Bulletin mentioned above. In this connexion it is interesting to note that mineral substances, especially common salt, and milk in some form are particularly useful in promoting rapid and healthy growth. The research work carried out in Northern Ireland has clearly emphasized the importance of these

NOTES ON FEEDING

foods, while as regards common salt, it is claimed that even the laying hen must have her quatum in the mash, $\frac{1}{2}$ per cent. being the suggested addition.

Rations for Layers.—Great differences of opinion exist as to what constitutes the ideal layer's mash. Among practical poultry farmers, one comes across the man who includes 40 per cent. of bran, but not more than 20 per cent. of maize meal; the man who swears by maize to the tune of 50 per cent. but will have no more than 10 per cent. of bran; some who like ground oats, others who insist upon alfalfa meal (or clover meal) and so on. These differences remain to be settled by critical experiments, but in the meantime it is surely safer to avoid extremes in the compounding of any ration. Bran contains approximately 10 per cent. of fibre, not more than one-tenth of which can be digested by the fowl, so it would seem good policy to restrict the bran to say 15 per cent. of the mash.

Similarly maize meal is very fattening, is apt to become "soggy" and is deficient in mineral matter—all points which argue against the inclusion of large amounts of this food in the ideal ration.

A further question is: "What amount of protein-rich food should be added?" In theory, it is possible to calculate the amount of digestible protein necessary to meet the demands of a given rate of egg production, and tentative standards have been put forward as a basis for such calculations. These standards, however, have recently been discounted to some extent by the over-zealous hens in Northern Ireland, which insisted upon laying large numbers of eggs despite the limitations imposed by a cereal diet. It is only fair to add, however, that these birds had access to grass runs, and therefore doubtless consumed a considerable amount of protein in the shape of "earned" food—grass, insects, worms, etc.

The farmyard hen has an even better chance to supplement her diet, but it must not be assumed that any bird can maintain a high level of production without receiving a comparatively rich ration. Rather will it be necessary, in attempting to set the feeding of laying stock on a scientific basis, to obtain accurate estimates of the amount and quality of "earned" food, in order that we may frame two separate feeding standards (a) for birds kept intensively, and (b) for birds on range.

Meanwhile it would be premature to advocate the

NOTES ON FEEDING

omission of protein-rich foods from the layer's mash, on the ground that they are not really essential if the birds are kept in the open. The keen poultryman explores these matters for himself.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	7 18
Maize	78	7.6	6 8
Decorticated ground-nut cake	73	41.3	7 5
„ cotton cake ..	68	34.7	7 2

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 2.03 shillings, and per unit protein equivalent, 0.28 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1933, issue of the Ministry's JOURNAL, p. 784.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s
Wheat	72	9.6	7 9
Oats	60	7.6	6 4
Barley	71	6.2	7 6
Potatoes	18	0.8	1 17
Swedes	7	0.7	0 14
Mangolds	7	0.4	0 14
Beans	66	19.7	6 19
Good meadow hay	37	4.6	3 16
Good oat straw	20	0.9	2 1
Good clover hay	38	7.0	3 19
Vetch and oat silage	13	1.6	1 7
Barley straw	23	0.7	2 7
Wheat straw	13	0.1	1 6
Bean straw	23	1.7	2 7

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	5 3	0 8	4 15	72	1 4	0.71	9.6
Barley, Canadian, No. 3 Western..	7 18	0 7	7 11	71	2 2	1.16	6.2
" Argentine	8 0	0 7	7 13	71	2 2	1.16	6.2
" Persian	7 15*	0 7	7 8	71	2 1	1.12	6.2
Oats, English white	6 17	0 8	6 9	60	2 2	1.16	7.6
" black and grey	6 17	0 8	6 9	60	2 2	1.16	7.6
" Scotch White.. ..	7 15	0 8	7 7	60	2 5	1.29	7.6
" Canadian No. 2 Western ..	8 3	0 8	7 15	60	2 7	1.38	7.6
" No. 3	8 7*	0 8	7 19	60	2 8	1.43	7.6
" mixed feed	6 10	0 8	6 2	60	2 0	1.07	7.6
" Argentine	7 17	0 8	7 9	60	2 6	1.34	7.6
" Chilian	7 15	0 8	7 7	60	2 5	1.29	7.6
Maize, Argentine	6 7	0 6	6 1	78	1 7	0.85	7.6
" Danubian Gal. Fox	6 7†	0 6	6 1	78	1 7	0.85	7.6
" Russian	6 10†	0 6	6 4	78	1 7	0.85	7.6
Peas, Japanese	20 17†	0 13	20 4	69	5 10	3.12	18.1
Dari	7 5†	0 7	6 18	74	1 10	0.98	7.2
Milling offals—Bran, British ..	6 2	0 14	5 8	43	2 6	1.34	9.9
" broad	6 15	0 14	6 1	43	2 10	1.52	10
Middlings, fine, imported ..	6 15	0 11	6 4	60	1 10	0.98	12.1
Weatings†	6 17	0 11	6 6	56	2 3	1.21	10.7
" Superfine†	7 17	0 11	7 6	69	2 1	1.12	12.1
Pollards, imported	6 5	0 11	5 14	50	2 3	1.21	11
Meal, barley	9 0	0 7	8 13	71	2 5	1.29	6.2
" grade II	8 5	0 7	7 18	71	2 3	1.21	6.2
" maize	7 2	0 6	6 16	78	1 9	0.94	7.6
" germ	7 2	0 10	6 12	79	1 8	0.89	8.5
" locust bean	7 7	0 5	7 2	71	2 0	1.07	3.6
" bean	8 5	0 15	7 10	66	2 3	1.21	19.7
" fish	16 0	1 18	14 2	59	4 9	2.54	53
Maize, cooked, flaked	7 12	0 6	7 6	84	1 9	0.94	9.2
" gluten feed	6 10	0 11	5 19	76	1 7	0.85	19.2
Linseed cake, English, 12% oil ..	10 5	0 18	9 7	74	2 6	1.34	24.6
" " " 9% "	9 17	0 18	8 19	74	2 5	1.29	24.6
" " " 8% "	9 12	0 18	8 14	74	2 4	1.25	24.6
" " " 6% "	9 17‡	0 18	8 19	74	2 5	1.29	24.6
Soya-bean cake, 5½% oil	8 5*	1 5	7 0	69	2 0	1.07	36.9
Cottonseed cake—English, Egyp- tian seed, 4½% oil	5 5	0 16	4 9	42	2 1	1.12	17.3
" " Egyptian, 4½% " ..	5 0	0 16	4 4	42	2 0	1.07	17.3
" " decorticated, 7% " ..	7 2†	1 5	5 17	68	1 9	0.94	34.7
" meal, decorticated, 7% " ..	7 5†	1 5	6 0	68	1 9	0.94	34.7
Coconut cake, 6% oil	6 17	0 16	6 1	77	1 7	0.85	16.4
Ground-nut cake, 6-7% oil	6 17*	0 17	6 0	57	2 1	1.12	27.3
" " decor., 6-7% oil ..	7 15	1 5	6 10	73	1 9	0.94	41.3
" " imported, ...							
" decorticated, 6-7% oil ..	6 15	1 5	5 10	73	1 6	0.80	41.3
Palm-kernel cake, 4½-5½% oil ..	6 5†	0 11	5 14	73	1 7	0.85	16.9
" " meal, 4½% oil	6 5†	0 11	5 14	73	1 7	0.85	16.9
" " meal, 1-2% oil	6 5	0 11	5 14	71	1 7	0.85	16.5
Feeding treacle	5 0	0 7	4 13	51	1 10	0.98	2.7
Brewers' grains, dried ale	5 12	0 10	5 2	48	2 1	1.12	12.5
" " " porter	5 5	0 10	4 15	48	2 0	1.07	12.5
Dried "sugar" beet pulp (a)	5 10	0 5	5 5	66	1 7	0.85	5.2

(a) Carriage paid in 5 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of August 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 18s. per ton as shown above, the cost of food value per ton is £9 2s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 6d. Dividing this again by 27.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.34d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 6d.; P₂O₅, 2s. 1d.; K₂O, 3s. 1d.

MISCELLANEOUS NOTES

Cider Fruit Crop Estimate, 1934

ESTIMATES of the probable yield of cider fruit in England and Wales, furnished by Inspectors of the Ministry of Agriculture and Fisheries, indicate that the yield will be appreciably heavier than for some years past. The figure given for Devon does not include worn out or immature orchards.

The following table shows the index figure for each of the principal districts, together with the corresponding figure for 1933. The scale on which the index figures are based is as follows:—

25 or under = very bad; 26-35 = bad; 36-45 = poor; 46-55 = fair; 56-65 = very fair; 66-75 = good; over 75 = very good.

					1934.		1933.
Devon	..	..	..	..	75	..	40
Dorset	..	..	..	..	80	..	50
Gloucester, West	..	..	..	..	65	..	55
Hereford	..	..	..	..	70	..	50
Monmouth	..	..	..	..	58	..	13
Somerset	..	..	..	..	70	..	48
Worcester, West	..	..	..	..	60	..	35
Worcester (Worcester and Droitwich areas)					90	..	26

Stud Goat Scheme

THIS scheme, having for its object the improvement of the productive quality of milch goats kept by smallholders, cottagers and others of similar position, is again in operation. For the current breeding season, which lasts till February 28 next, 76 stud goats have been registered, and are standing at various centres throughout the country, including 8 in Wales, and their services are available for goats belonging to persons in the above-mentioned categories at a nominal fee in no instance exceeding 4s. For this season only goats that are naturally hornless have been accepted, and no transfers of ownership or substitutions of goats will be permitted. Conditions of service and other information may be obtained from the County Agricultural Organizers at their respective County Education Offices, or from the Secretary of the British Goat Society, which is responsible for the administration of the scheme, at Roydon Road, Diss, Norfolk.

MISCELLANEOUS NOTES

The report on the operation of the scheme during the season 1933-34 shows steady progress in several directions. Of 89 goats registered, only 7 failed to qualify for premium. 1,716 services were allowed for premium, an increase of 26 on those of the past year, and a greater number per registered goat than during any previous season.

In the August issue of this JOURNAL reference was made to a record twenty-four hours' yield established by Ch. Feltham Frisky Q*Q*Q*Q*Q*, which gave 21 lb. 10 oz. at the Oxfordshire Agricultural Society's Show at Henley on May 23 last. A new record has now been created by Bitterne Penelope Q*, which gave a yield of 22 lb. 7 oz. at the New Forest Show held at Lyndhurst on July 25.

Rothamsted Winter Lectures

As in previous years, Sir John Russell, Director of the Rothamsted Experimental Station, has arranged that Mr. H. V. Garner, Guide-Demonstrator of this institution, and other members of the staff, shall be available during the winter, to deliver lectures on the experiments at the station, to chambers of agriculture and horticulture, farmers' clubs, farm workers' associations, agricultural societies, etc. No fee will be charged for the lecturer's services, but organizations will be expected to defray travelling and hotel expenses, and to make arrangements for holding the lectures. Only one subject can be treated in a single lecture. A list of lectures and lecturers may be obtained on application to the Secretary, Rothamsted Experimental Station, Harpenden, Herts, and requests for lectures should give as much notice as possible.

Scholarships for the Sons and Daughters of Agricultural Workmen and Others

THE selection of candidates in connexion with this year's awards under the Ministry's scheme of scholarships for the sons and daughters of agricultural workmen and others has now been completed. The total number of applications received was 579, and 128 scholarships have been awarded. These awards were allocated as follows:—

Ten Senior Scholarships tenable at university departments of agriculture or agricultural colleges for degree or diploma courses in an agricultural subject; 9 Extended Junior Scholarships, not exceeding one year in duration, for

MISCELLANEOUS NOTES

advanced or specialized courses of instruction at farm institutes or agricultural colleges; and 109 Junior Scholarships, tenable at farm institutes or similar institutions, for courses not exceeding one year in agriculture, horticulture, dairying or poultry husbandry, or in a combination of two of these subjects. The successful candidates include 94 men and 34 women applicants.

During the 13 years (1922-1934) that the scheme has been in operation, assistance has been granted to some 1,400 individuals involving the award of 1,622 scholarships. The distribution of these awards among the various classes of beneficiary is as follows:—

		<i>Twelve years,</i>		
		<i>1922-1933.</i>	<i>1934.</i>	<i>Total</i>
Sons or daughters of agricultural workmen ..		397	39	436
„ „ „ working farm bailiffs ..		116	9	125
„ „ „ smallholders ..		374	33	407
„ „ „ other rural workers ..		236	17	253
Candidates who qualified on their own account as bona-fide workers in agriculture ..		371	30	401
Total ..		<u>1,494</u>	<u>128</u>	<u>1,622</u>

The Agricultural Index Number

THE general index number of the prices of agricultural produce for August at 119 (the corresponding month of 1911-13=100) was 5 points above the previous month and 14 points higher than in August, 1933. The higher prices realized for fat cattle, barley and hay, together with seasonal increases in the prices of butter and eggs, were the factors responsible for the increase of 5 points in the general figure as compared with July. The encouraging rise of 14 points as compared with a year ago was due in the main to improved returns for fat cattle, sheep and pigs, milk, wool, hay and potatoes.

Monthly index numbers of prices of Agricultural Produce.
(Corresponding months of 1911-13=100.)

<i>Month.</i>		1929.	1930.	1931.	1932.	1933.	1934.
January		145	148	130	122	107	114
February		144	144	126	117	106	112
March		143	139	123	113	102	108
April		146	137	123	117	105	111
May		144	134	122	115	102	112
June		140	131	123	111	100	110
July		141	134	121	106	101	114
August		152	135	121	105	105	119
September		152	142	120	104	107	—
October		142	129	113	100	107	—
November		144	129	112	101	109	—
December		143	126	117	103	110	—

MISCELLANEOUS NOTES

Grain.—Wheat at an average of 5s. 1d. per cwt. was 3d. cheaper than in July and the index depreciated 2 points to 64. If allowance is made for the "deficiency payment" under the Wheat Act, 1932, the index would be increased to approximately 119, the effect of which would be to raise the general index for agricultural produce from 119 to 123. A sharp increase of 2s. to 9s. 4d. per cwt. occurred in the average for barley, the index rising 25 points to 123. Oats were 1d. per cwt. dearer on the month and at 92 the index was 9 points higher. In August, 1933, wheat averaged 5s. 9d., barley 9s. 6d., and oats 5s. 6d. per cwt., the indices being 72, 125 and 79 respectively.

Live Stock.—Prices for fat cattle advanced slightly during the month under review and the average of 35s. 11d. per live cwt. for second quality was 10d. higher; the index advanced 7 points to 106. Quotations for fat sheep were unchanged during August and the index at 128 remained steady. Bacon pigs at 10s. 7d. and porkers at 11s. 5d. per score for second quality were dearer by 2d. and 3d. respectively, but, as these increases were proportionately smaller than those which occurred in the base period, the index for baconers declined 2 points to 103, while that for porkers was unaltered at 108. The prices of dairy cows and store cattle showed little material change on the month and the indices at 104 and 85 remained stationary. Quotations for store sheep continued to move downwards and the index declined by 4 points to 104. Store pigs, however, were dearer, and at 139 the index was 4 points higher.

Dairy and Poultry Produce.—The average of the wholesale contract prices for the sale of milk during August was the same as in July, and the index at 168 was unaltered. Cheese was a little dearer and the index rose from 90 to 96. Quotations for butter and eggs showed the usual upward trend during August. Butter averaged 1½d. per lb. more on the month and the index appreciated from 87 to 92. The advance of 3½d. per dozen in the average for eggs was rather more pronounced than usual and the index was 22 points higher at 119. Prices for fowls and ducks continued to fall, but geese were dearer, and the combined index for poultry increased by 2 points to 116.

Other Commodities.—Quotations for early potatoes showed the customary fall during August, but as the decrease between July and August, 1911 to 1913, was proportionately much larger, the index advanced 17 points

MISCELLANEOUS NOTES

to 153. Both clover and meadow hay were dearer on the month, the combined index at 101 showing an increase of 10 points. Wool was again dearer, the index appreciating one point to 87. As regards fruit, both apples and plums have sold at prices below the pre-war level.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity				1932	1933	1934			
				August	August	May	June	July	August
Wheat				80	72	59	67	66	64
Barley				90	125	98	96	98	123
Oats				106	79	81	83	83	92
Fat cattle				118	100	95	94	99	106
" sheep				90	103	150	138	128	128
Bacon pigs				86	95	117	110	105	103
Pork				87	96	120	113	108	108
Dairy cows				110	104	100	101	104	104
Store cattle				113	98	88	87	85	85
" sheep				81	83	103	109	108	104
" pigs				86	115	134	135	135	139
Eggs				115	117	89	100	97	119
Poultry				117	120	129	126	114	116
Milk				148	150	162	162	168	168
Butter				100	92	85	87	87	92
Cheese				125	115	123	108	90	96
Potatoes				106	91	90	82	136	153
Hay				68	71	83	88	91	101
Wool				61	72	89	82	86	87

Revised index numbers due to Wheat Act payments.

Wheat				—	125	126	126	124	119
General Index				—	108	117	114	118	123

The Library of the International Institute of Agriculture

THE Library of the International Institute of Agriculture in Rome has now removed to new premises erected for the purpose in the gardens of the Villa Umberto I. Both externally and internally the decorations are of modern design, and characterized by simplicity. The books are housed in the basement and arranged in steel shelves on three floors connected by steel staircases and an electric elevator. In the centre of the ground-floor there is a large reading-room with accommodation for some forty visitors; the room is divided into two parts, one containing the

MISCELLANEOUS NOTES

general reference library, and the other devoted to periodicals. Around this central reading room are situated the catalogue room and offices for the library staff. Already the library contains 270,000 books and pamphlets relating to all branches of agricultural science, while the number of current periodicals received amounts to 3,366, representative of every important language in the world.

Agricultural Research Scholarships and Studentships

ON the recommendation of the Agricultural Research Council, post-graduate Scholarships and Studentships have been awarded by the Ministry of Agriculture and Fisheries as follows:—

Agricultural Research Scholarships.

F. X. Aylward.

W. F. Darke.

J. A. Freeman.

Studentships for Research in Animal Health.

D. L. Hughes.

H. Wilkinson.

These awards are made with the object of training students for research work in agricultural science or diseases of farm stock. They are tenable for three years commencing with the forthcoming academic year.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at Kings Buildings, Smith Square, London, S.W.1, on September 24, 1934, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders:—

Devonshire.—An Order fixing minimum and overtime rates of wages to come into operation on September 30, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until March 23, 1935. The minimum rate for male workers of 21 years of age and over is 32s. (instead of 31s. as at present) per week of 52 hours in summer and 50 hours in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 32, with overtime throughout the period unchanged at 8½d. per hour on weekdays, and 10d. per hour on Sundays and for overtime employment on the hay and corn harvests. The minimum rate for female workers of 21 years of age and over is unchanged at 6d. per hour for all time worked.

Gloucestershire.—An Order fixing minimum and overtime rates of wages to come into force on October 7, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until October 5, 1935. The minimum rates for male workers of 21 years of age and over are as follows: head carters, 34s. 6d. per week of 58 hours in summer, except

MISCELLANEOUS NOTES

in the week in which Good Friday falls when the hours are 51, and 36s. (instead of 34s. 2½d. as in the winter of 1933) per week of 60 hours in winter, except in the week in which Christmas Day falls when the hours are 52½; head shepherds and head stockmen 36s. per week of 60 hours in any week, except in the weeks in which Christmas Day and Good Friday fall, when the hours are 52½; under-carters, 32s. 6d. per week of 54 hours in summer, except in the week in which Good Friday falls when the hours are 48, and 34s. 6d. (instead of 32s. 9½d. as in the winter of 1933) per week of 57 hours in winter, except in the week in which Christmas Day falls when the hours are 50½; under-shepherd, and under-stockmen 34s. 6d. per week of 57 hours except in the weeks in which Christmas Day and Good Friday fall when the hours are 50½; other male workers 30s. per week of 50 hours in summer, except in the week in which Good Friday falls when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½. The overtime rates for all male workers of 21 years of age and over are 9d. per hour on weekdays and 11d. per hour on Sundays. The minimum rate for female workers is 5d. per hour.

Lincolnshire (Holland).—An Order fixing minimum and overtime rates of wages to come into force on October 28, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until October 26, 1935. The minimum rates for male workers of 21 years of age and over are 33s. per week of 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½, and 50 hours in summer, except in the weeks in which Easter Monday and August Bank Holiday fall when the hours are 41. In the case of horse-men, cattlemen and shepherds of similar age, inclusive weekly sums are fixed to cover all time worked in excess of the number of hours mentioned, except employment which is to be treated as overtime employment. The overtime rates for male workers of 21 years of age and over are 10½d. per hour on Saturdays (or on any other day agreed as a weekly short day); 1s. 1½d. per hour on Sundays and on Christmas Day; 8d. per hour on Easter Monday and August Bank Holiday, and 9d. per hour for all other overtime employment. The minimum rate for female workers of 15 years of age and over is 6d. per hour for all time worked.

Shropshire.—An Order varying the existing minimum and overtime rates of wages to come into operation on September 30, 1934. The minimum rate for male workers of 21 years of age and over is 31s. (instead of 30s. as at present) per week of 54 hours with overtime unchanged at 9d. per hour on weekdays and 10d. per hour on Sundays. The minimum rate for female workers of 18 years of age and over remains unchanged at 5d. per hour with overtime at 6d. per hour.

Pembroke and Cardigan.—An Order fixing minimum and overtime rates of wages to come into force on October 1, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until September 30, 1935. The minimum rates in the case of male workers of 21 years of age and over are 30s. 6d. (instead of 30s. as at present) per week of 52 hours in winter and 54 hours in summer, with overtime on weekdays and on Sundays at 8d. per hour. The minimum rate for female workers of 18 years of age and over is unchanged at 5d. per hour for 8 hours a day throughout the year, with overtime on weekdays at 6d. per hour and on Sundays at 6½d. per hour for the first three hours and 7½d. per hour for subsequent hours.

Enforcement of Minimum Rates of Wages.—During the month ending September 14, legal proceedings were taken under the Agricul-

NOTICES OF BOOKS

tural Wages (Regulation) Act, 1924, against three employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.	Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
Hampshire ...	Kingsclere	£ s. d. •	£ s. d. 4 4 0	£ s. d. 30 0 0	3
Northampton ...	Towcester	4 0 0	2 2 0	36 9 0	1
Pembroke and Cardigan ...	Saunders-foot	0 10 0	0 5 0	5 5 6	1
		£4 10 0	6 11 0	71 14 6	5

* Dismissed under Probation of Offenders Act.

Wireless Talks to Farmers in October.—Agricultural talks in October will be given not only in the National programme, but the Scottish, Midland and West Regional stations have also arranged special series of their own.

The National talks will, as usual, be of a topical character, and Mr. John Morgan continues his discussions with various farming experts. From Scottish Regional the following talks will be given during October:—

- October 11. 6.45 p.m. Scottish Production in Relation to World Prices: a Discussion between Sir Robert Greig and Mr. Joseph Duncan.
19. Talk for Scottish Farmers Only. (This begins a series of fortnightly talks at approximately 6.45 p.m. on Fridays. These are additional to the talks for farmers which are given on Thursdays.)
25. „ Alternate Methods of Feeding: Mr. Arthur Crichton.

From the Midland Station, a series for farmers in that area will be given on Thursday evenings by Mr. W. B. Thompson, Farm Director and Vice-Principal at the Harper Adams Agricultural College, Newport, Salop.

The West Regional Station has been broadcasting two series of talks for farmers for some months and these are being continued this autumn. One is called "For Western Farmers in Particular" and the other is the monthly "Market Special."

NOTICES OF BOOKS

World Agriculture and the Depression. By Vladimir P. Timoshenko. Michigan Business Studies. Volume V. Pp. 123. (Ann Arbor: University of Michigan. 1933. Price \$1.)

Professor Timoshenko has made an interesting and valuable contribution to the study of agriculture in relation to the world depression, and, incidentally to this study, he brings into relief, in regard to agricultural countries, certain factors that are too often overlooked.

The author first of all examines the course of prices in recent years, calling attention to its downward tendency before the crisis of 1929, and concludes, on clear evidence, that before 1929 the world was faced with over-production of certain primary commodities, as shown in particular by the progressive accumulation of stocks. He then pro-

NOTICES OF BOOKS

ceeds to examine the foreign trade between agricultural and industrial countries, pointing out the relatively rapid growth of exports by industrial countries and imports by agricultural countries in comparison with the relatively slow growth of exports by agricultural countries. This leads to what is, perhaps, the most important part of the book—the study of the balance of payments of agricultural countries before and during the depression of 1929 to 1933. The author points out that the favourable balance of trade of agricultural debtor countries was declining before the crisis, and had ceased some years before 1929 to meet the interest and dividend charges due to foreign countries. The difference between the two had been made up by fresh borrowings abroad.

The fall in prices of primary products in 1929, coupled with the heavy burden of fixed interest charges on foreign debts, put the agricultural debtor countries into a position of great financial difficulty, which in turn was increased by the difficulties of maintaining the flow of fresh borrowings owing to the financial stringency in foreign countries. Ultimately this led to the breakdown of confidence amongst investors in industrial countries, and to a complete cessation of new lending to the agricultural countries. The author then shows how these events led both to a depreciation of the currency in debtor countries and to an intensification of fiscal restrictions imposed in an effort to maintain the balance of international payments. Thus the precarious debt and credit position of certain countries before the crisis of 1929 became in the ensuing years a powerful factor in bringing about the contraction of international trade, which is one of the most conspicuous features of the economic depression.

The Countryman's Jewel. Days in the Life of a Sixteenth-Century Squire. Ed. by Marcus Woodward. Pp. xii + 310 with frontispiece. (London: Chapman & Hall Ltd. 1934. Price 15s.)

The books that have been used in this compilation are collector's pieces, and are consequently not widely known to the general reading public. We owe, therefore, a debt of gratitude to Marcus Woodward for the amalgam that he has so carefully produced and set before us in all the beauty of modern printing, which makes the circumlocutions and periphrases of Tudor literary English so much more easy to assimilate; and the amalgam has been extremely well prepared and provided with the halo of romance so invariably associated with rural life in our modern urban civilization. The romantic flavour is indeed so well injected as to create some doubt of the validity of certain of the claims made.

To make the circumstances of a man's life and death mysterious adds interest, but it seems a little unnecessary to cast a veil of mystery over the exact period of his life when we know very well that Leonard Mascall died at Farnham Royal, Buckinghamshire, and was buried there on May 10, 1569, a year before the last of his books was published.

To project oneself into a remote historical period is, as the preface states, a very similar journey to one into a remote and less civilized country and has an equal and similar fascination; and the compiler of this work has been successful in his self-projection. In some respects, however, exception may be taken to the method he has adopted. He has been optimistic in the description of the furnishing of a 16th-century manor house; various articles are included in the equipment of each room as if they were the normal usage of the day, but the evidence of contemporary probate inventories shows that things such as ornate clocks, looking-glasses, wash-hand basins and jugs were altogether more rare and unusual than is suggested.

Again, a far larger proportion of the book is composed of extracts from Estienne and Liebault's "*Maison Rustique*," than from Mascall's own writings. It is suggested that Mascall was engaged in a translation of this work; it is possible that he was. It is almost certain

NOTICES OF BOOKS

that the book was available to him, and clearly he was qualified to read it, but no published translation by Mascall has come down to us. It was not published in English until 1600, when Surfleet's version appeared. Before that date, however, there was not only the French original, but Dutch, German and Italian translations were available. The objection to the adoption of large parts of this work as a description of life in England in late Tudor times is that the book itself is largely a transcript of the writings of the old classic authors, Varro, Pliny and Columella, and that in addition it has a decidedly Continental flavour. While in Western Europe manorial life may have been very similar over wide areas, there were no doubt local variations, and although there was a good deal of communication between the mainland and Great Britain, the variation was probably greater between England and the mainland than between any of the different portions of the mainland itself.

The editor also suggests that Mascall's claim that he was the first to introduce carp and pippins to this country, which has been subscribed to by Fuller, is valid. This is another attempt to add a romantic quality to his hero, because neither of these claims is historically true.

In spite of these minor criticisms, the book is intensely interesting, and does, as already pointed out, permit one to read contemporary descriptions of Tudor days with a pleasure that can only be found by the connoisseur when tackling the original prints with their crowded black-letter pages; and the book does make more readily accessible these extracts from the productions of one of our remote ancestors, who certainly deserves to be rescued from the comparative oblivion which has overtaken him. A very pleasant occupation for many hours of leisure can be found within the covers of this book, and the pleasure is not exhausted on an initial reading. A delightful story indeed!

The Principles and Practice of Marketing. By R. Simmat, M.A.
Pp. xvii + 247. (London: Sir Isaac Pitman & Sons Ltd. 1933.
Price 12s. 6d.)

This book is intended for the guidance of the "small man," whether he be manufacturer, packer, wholesaler or retailer, and covers the field of marketing from the standpoint both of sales promotion and of the adjustment of merchandizing policy to the requirements of the consumer of raw materials or "finished" goods. Business executives are cautioned to submit proposals for an advertising campaign to recognized psychological tests, and are advised that the "education of a market should only be initiated after a careful and scientific study of the possibilities." The author describes the equipment for the requisite market research department, as well as the principles to be observed when interpreting statistical data collected by means of the questionnaire and the consumer panel. Advertising technique is treated on conventional lines, but includes a practical discussion on the standardization of packages, which will appeal both to the agriculturist and a quality control authority. Brands are evaluated as "the means employed by individual manufacturers to identify certain products as being proper to them," but the author could have illustrated much more clearly the relationship between the nature or quality of a product and the recognized mark of a quality control authority. No reference is made to the National Mark, while the paragraph on the designations indicating country of origin fails to distinguish the standardization policy of the country of which the mark of origin is often symbolic. A discussion on the relationship between container design and the attractiveness and utility of the container, leads up to the enumeration of the Ullman check list of the attributes of a successful package design. The author concludes that while the art of package design consists in evolving pleasing shape and proportion

NOTICES OF BOOKS

that give, at the same time, an illusion of large capacity, yet the most effective design cannot influence the consumer to make a second purchase.

Le Problème Mondial du Blé. (*The World Wheat Problem*). By Paul de Hevesy. Preface by H. Béranger. Pp. vii + 293. (Paris 6e: Librairie Félix Alcan, 108, Boulevard Saint-Germain. 1934. 30 francs.)

In this thoughtful and attractively written monograph, the Hungarian Minister at Madrid presents an ingenious scheme for the solution of the world wheat problem. For the purposes of this scheme, all countries concerned in the production and consumption of wheat would be invited to enter into a new International Wheat Agreement and to nominate a representative to serve on an International Wheat Council, which would be responsible for the operation of the scheme. As the executive organ of the Council, there would be established, in London, an International Wheat Office having monopoly control over the importation and exportation of wheat by the participating countries, in each of which corresponding monopoly offices would be established. The national offices would buy and sell wheat exclusively through the agency of the International Office.

Each year, the International Council would estimate the aggregate import requirements of the participating countries and, in the light of this estimate, would allot quotas to the exporting countries, the basis of the allotment being a proportion of the average exports from each country in the preceding five years. In August, the Council would fix the world price of wheat for the next crop year. This price would apply only to international transactions, that is, to imports and exports of wheat. The price to be fixed would be higher than that at present prevailing, the aim being to fix it at a level which would be equitable as between exporting and importing countries.

Of special interest are the suggestions for the adjustment of production in exporting countries. These involve the determination each year, before planting, of the "logical production," that is to say, the estimated total requirements of wheat for domestic consumption *plus* the export quota. This figure divided by the average yield per acre for the country would indicate the acreage of wheat which should be planted. In accordance with these estimates, the National Wheat Office would invite producers to reduce or increase their acreage by a certain percentage compared with that of the previous year. Those who conformed to this recommendation would receive a fixed price for their share of the "logical production." If, owing to the yield per acre being greater than the average, their actual output were larger than this, they would receive for the excess supply the same price as the non-conforming producers would receive for the whole of their output. This price would be calculated by dividing the funds available, after setting aside a sum sufficient to pay conforming producers a fixed price for their share of the "logical production," by the total output of the "non-conformists" *plus* the excess output of the "conformists." In order to encourage the development of production on the most suitable land and by efficient producers, the sale of production rights would be permitted.

It is recognized that, at present, the large accumulation of unsold stocks in exporting countries is a menacing factor on the world market. In order to get rid of this bugbear, it is suggested that large importing countries, such as Great Britain, should establish a reserve of wheat, amounting to approximately 54 days' supply, against unforeseen eventualities. While this would, no doubt, tend towards a solution of the problem of unsold stocks, the reasons why importing countries should, in their own interests, undertake such a policy, are not very convincing.

The author does not ignore the formidable political and practical difficulties which would have to be overcome before the scheme could

NOTICES OF BOOKS

be put into effective operation. Nevertheless, in the series of chapters summarizing the recent policies of importing and exporting countries, he shows, in a convincing manner, that some of the main elements in his scheme have already been adopted in many countries, and that to superimpose on these national policies some further measure of international co-operation should not be beyond the capacity of wise and resourceful statesmanship. On the urgency and importance of this task he lays the strongest possible emphasis:—

“At the base of the world crisis, there is the crisis in agriculture. At the base of the agricultural crisis there is the wheat crisis. If we succeed in raising the price of wheat and, in this way, enable the producers of wheat everywhere to obtain a larger proportion of the money spent by consumers, we shall have attacked the world crisis at its foundations.”

Whether this view of the situation can be accepted without reservation or not, there can hardly be any doubt that the effects of the wheat crisis have been world-wide, and that a complete solution of the wheat problem must, of necessity, involve international action. To this end, M. de Hevesy has made a real and valuable contribution.

Commercial Fertilizers: Their Source and Use. By G. H. Collings, B.S., M.S., Ph.D. Pp. xiv + 356, and 85 Figs. (Philadelphia: P. Blakiston's Son & Co., Inc., 1012, Walnut Street. 1934. Price \$3.25.)

This is a compact, well-arranged and carefully edited book, designed as a text-book for agricultural colleges and as a guide to the industry. It is the result of the author's sixteen years of experience as agronomist at an experimental station and teacher at an American agricultural college. The main emphasis is placed upon sources of raw materials, processes of manufacture, and the characteristics and principal uses of the manufactured products. Not only will this volume be found useful by specialists in the fields of agronomy, soil science and the fertilizer industry, but also by the farmer and his technical advisers, as well as others who require for periodical consultation an up-to-date source of reliable information upon the newer forms of commercial fertilizer now on the market.

Eggs. By M. E. Pennington, F. L. Platt and C. G. Snyder. Edited by P. Mandeville. 2 vols. Pp. xxiv + 631, and 257 Figs. (Chicago: Progress Publications, 1530 Merchandise Mart.)

The authors of this publication have attempted to record in popular language the progress made in the American poultry industry from the earliest times down to the present day. Volume I comprises in small compass the story of the progress made in the science and practice of poultry culture, by F. L. Platt, together with a comprehensive section on the testing, cold storage and marketing of poultry products, by Miss M. E. Pennington. Volume II is neither more nor less than a cookery manual devoted entirely to eggs and poultry. In it Mrs. C. G. Snyder has written extensively concerning methods of preparing appetising and attractive forms of these foods for the table; such a collection of recipes (including some of historical interest) would not be out of place on the bookshelf of the housewife, but it is doubtful if it will prove of much value to the practical farmer or poultry-keeper.

Garden Science: A Three Years' Course. By R. Berks, A.C.P. Pp. ix + 123. Illustrated. (London: Thomas Nelson & Sons, Ltd. 1933. Price 2s.)

Teachers and others responsible for the teaching of garden science, nature study or elementary biology, will find this book both stimulating and useful. In such courses time usually does not permit of separate attention being given to physics, chemistry and botany; a course of general science therefore has to suffice, and nothing is more

NOTICES OF BOOKS

difficult to devise. The author makes a successful working scheme for rural schools, and has the commendable ideal of aiming to arouse the natural curiosity of the pupil when performing the ordinary task of digging and manuring the soil and in the growth of plants, so that eventually these operations will be performed with intelligence, forethought and skill. The book is full of interesting experiments and suggestions arranged as a syllabus, of three courses each of one year, and by adding to this his own personal enthusiasm the teacher should be able to give thoroughly instructive courses and to instil a lifelong scientific habit of thought in his gardening pupils.

Woollen and Worsted Raw Materials. By J. R. Hind, M.R.S.T., A.T.I. Pp. x + 214. (London: Ernest Benn Ltd. 1934. Price 8s. 6d.)

This volume is designed to cover the syllabus of examinations issued by the City and Guilds of London Institute. Although Chapter XIV on Tops and Qualities does not appear in the syllabus for woollen yarn manufacture, students will find in it useful information on the wool quality numbers. Similarly, Chapter XV on Textile Wastes, while not included in the worsted syllabus, should yet be of value to students of worsted as enabling them to realize how the woollen spinner utilizes materials that a worsted spinner regards as "waste." The book should appeal to all who purchase, sell or manufacture the raw materials of the wool textile industry.

Soil Analysis : A Handbook of Physical and Chemical Methods. By C. M. Wright, M.A., F.I.C. Pp. viii+236 and 6 figs. (London: Thomas Murby & Co. 1934. Price 12s. 6d.)

Methoden für die Untersuchung des Bodens, II Teil. (*Methods of Soil Investigation. Part II.*) [3. Beiheft zur "Zeitschrift für Pflanzenernährung, Düngung und Bodenkunde."] Edited by Dr. C. Lemmermann. (Berlin, W.35: Verlag Chemie G.m.b.H., Corneliusstrasse, 3. 1934. Price RM.7.50.)

One of our leading philosophers has recently said that "theory dictates method" and "the criticism of a theory consists in noting its scope of useful application." If these conclusions are accepted, comparison of these two laboratory manuals on the methods of the soil research worker and analyst would suggest that theories about soils are dominated by a scientific nationalism. The books have the same purpose—to set out the full working details of recognized methods of soil examination—but they have little else in common. The study of soils is inevitably influenced by local agricultural and geographical conditions, but it is difficult to justify parochialism when experience gained in this country has to be applied increasingly in the tropical jungle or desert. Although in their choice of authorities and in the details of the methods, these two books are as different as the languages in which they are written, they will do something to break down the barriers, for the English or German reader now needs only to refer to one book in the other language instead of to numerous journals.

Mr. Wright's book consists of an admirable statement of the working details of the recognized chemical and physical methods in use in the principal British and American laboratories, and, in addition, it sets out fully the recommendations made by Committees of the International Society of Soil Science. As Senior Agricultural Chemist in Nigeria, the author knew the difficulties of the soil worker who was without ready access to good libraries. His book will prove invaluable both to isolated workers and to those who may lack the opportunity to do justice to the libraries available. Mr. Wright makes no attempt to expound the principles of general analytical chemistry or soil science; his book is not for elementary education but for everyday use in the laboratory by competent workers. The methods chosen deal mostly with quantities that can be accurately defined; the much-

NOTICES OF BOOKS

debated empirical chemical and biological methods of estimating nutrient contents and fertilizer requirements are not described.

The other book is the second part of a collection of methods issued by a joint committee of the Association of German Agricultural Experiment Stations and the German Society of Soil Science, which was charged with the development of uniform methods for soil investigation. The first volume appeared in 1932 and the index in the second part covers both volumes. The principal subjects in the second part are mechanical analysis (modifications and alternatives), soil density, colorimetric methods for most of the common elements in soils, empirical methods for available nutrients. A lengthy section is devoted to the Vageler-Alten method of soil analysis by which some half-dozen or more estimates or approximate analytical results are combined into a complex quadratic equation, the solution of which is claimed to give the additional nutrient requirement of the following crop. For British readers the book may prove more useful as a key to German literature than as a laboratory guide.

Co-operation in Changing Italy. By K. Walter. Pp. x + 81. (London: P. S. King & Son Ltd. 1934. Price 2s. 6d.)

This short survey of the position of co-operative societies in Italy makes it clear that the Italian Government appreciates the strength of the co-operative movement. It has consequently been the policy of the Fascist regime to stimulate the growth and development of the movement, but to prescribe the directions in which it is to develop. It is not possible to measure statistically the success of this policy, but there is little doubt that, under the Government's direction, the co-operative movement has assumed proportions sufficient to affect a large part of the economic life of the nation. Rather surprisingly, perhaps, the system of "compulsory co-operation" has not been attempted in Italy, but the success of voluntary co-operation has undoubtedly been helped by the Government's willingness to step in to the aid of the co-operative societies when compulsory powers were needed.

The book opens with a chapter dealing with the recent history of co-operation in Italy, leading up to the constitution and status of the Co-operative Federations and the National Union under the important law of March 2, 1931. The remaining chapters give a short account, both statistical and descriptive, of the work of the societies in each Federation—consumers', labour and production, transport, farming, building, requirements, processing, mutual aid and insurance; and in conclusion the present importance and future of the co-operative movement in Italy are briefly discussed.

Moutons de Plein Air (*Open-Air Sheep Farming*). By J. Troupeau-Housay. Pp. 146. (Paris: Librairie Agricole de la Maison Rustique, 26 rue Jacob, VIe. 1934. Price 7 frs.)

This brochure forms an interesting plea for development of sheep farming in France. The author deplores the diminution of the sheep population in that country and its consequent dependence on importation of sheep and wool. He points out that, particularly in the southern midlands of France, a great deal of land that might well serve as sheep farms has recently passed out of cultivation. In his opinion, sheep farming has largely fallen into disrepute among French farmers through the "indoor" methods pursued in the last 150 years. Undue confinement, originally practised to secure enhanced profit, has defeated its own object by producing a train of evils ranging from loss of stamina and fertility to high overhead charges. He pleads for reversion to more normal methods and draws particular attention to the excellent results achieved in Britain where the "outdoor" system prevails. This commends itself to him as reducing costs of labour and building, promoting health of flocks, enhancing value of mutton and wool, and permitting better utilization of manure, since excreta are returned direct to the soil.

NOTICES OF BOOKS

The various breeds of sheep that have attained any popularity in France are discussed in relation to their suitability for the "open-air" treatment recommended. The need for gradual introduction to outdoor life by a "mixed" method is stressed in the case of breeds inured to other ways. The author deals at length with the technique of the two varieties of outdoor sheep farming, i.e., the intensive (plot) and the extensive system. In relation to the former he works out the economics of a flock on 50 hectares (about 125 acres). Regarding the latter, he points out the natural adaptability of the sheep to free range on poor land and the advantages accruing therefrom. Fencing, water supply and other vital points are considered. The treatise ends with a comparison of actual costs and profits in the case of flocks actually kept on "indoor" and "outdoor" methods and with a recapitulation of the all-round merits of the latter.

To British readers the appreciation of Shropshire sheep is noteworthy. Grassland cultivation receives due attention on the ground that it is the grass, rather than the sheep, which should now be "intensively" cultivated.

Commercial Flower Forcing. By A. Laurie, B.S., M.A., and L. C. Chadwick, B.S., Ph.D. Pp. x+519, and 49 figs. (Philadelphia: P. Blakiston's Son & Co. Inc., 1012, Walnut Street. 1934. Price \$4.)

Flower-growing in the United States is carried out almost entirely under glass and has reached an impressive importance, especially as regards roses, carnations and chrysanthemums. So important has the industry become that Universities are able to appoint Professors in Floriculture. This volume is part of the general movement of "gradually changing the haphazard art of growing flowers into a scientific system with as little guesswork as possible, depending upon increased knowledge of the factors of production." Plants are considered as living organisms, and the book sets out the soil conditions necessary for their best growth, together with their propagation, diseases and pests. The major and minor flower crops are then described and the book ends with a chapter on wholesaling. General principles are throughout considered in the light of the results of fundamental and technical research.

The work is essentially a text-book, and should be valuable in all parts of the educational system, which includes the established departments of floriculture at Universities, short courses, and advisory centres for commercial growers; and, owing to its broad outlook, should also be of value to horticultural students in this country. Flower growers of all kinds will find much of interest in the notes on greenhouses and their construction, and the methods adopted for producing flowers in America.

Practical Poultry Management. By J. E. Rice, B.S., and H. E. Botsford, B.S. 31d edition, revised. Pp. xxi+592, and 347 figs. (London: Chapman & Hall Ltd. New York: J. Wiley & Sons Inc. 1933. Price 16s. 6d.)

This volume is intended as a text-book for American vocational school pupils and poultrymen, whether they keep their stock on a commercial scale or in small flocks. Chapters are devoted to each of the chief branches of the industry. Where operative activity is involved, specific directions are given for performing the task, while under the caption "General Information," or in separate chapters, there are lucid explanations of principles and practices related to these activities. Such a comprehensive and well-balanced manual should prove very useful to the public for which it has been specially designed, and *mutatis mutandis* it may also be consulted with profit by poultry-keepers in this country.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 8 November, 1934

NOTES FOR THE MONTH

Malting Barley Conference at Rothamsted

BARLEY growers and expert users of the barley crop were first brought into conference at Rothamsted six years ago, when papers were read on the production and the evaluation of malting barley. A further step was taken in a conference, held on October 10 this year, when a large gathering, representing all parties concerned with growing and utilization of barley, met to consider these and cognate matters. On this occasion, however, the material for discussion was a display of nearly 200 barley samples sent in by farmers from all the important barley-growing counties. These samples had previously been graded by an expert Committee of the Institute of Brewing, and the relevant agricultural information was on record for each of them. There were no papers, and the full time of the meeting was available for a discussion of the factors involved in the production of high-quality barley, the basis on which barley is evaluated by buyers, and various urgent questions at issue between barley producers and those who handle the crop. Mr. S. O. Radcliffe, President of the National Farmers' Union, took the chair.

Mr. H. Cherry-Downes opened the proceedings with an account of the samples, each of which had been valued independently by the four members of the expert committee, and an average arrived at for it. These values were then used to place the barleys in 8 categories. Only one out of 196 reached the first grade—a magnificent Plumage Archer, nearly perfect in size, shape and ripeness. This was grown in Kent, a county which provided many of the best samples on view. There were five in grade two (two of these also from Kent), four in grade three and fourteen in grade four.

NOTES FOR THE MONTH

The remainder were placed lower, there being 51 samples in grade six and 66 in grade seven. It appeared that the barleys of 1934 were not quite up to the standard of those of 1933, a very similar season, yet one in which the bulk of the English crop was good for malting. Indeed, the plentiful supply of good home-grown barleys of 1933 had established such a carry-over into the present season that trade in new barleys was still slow. The grading of the 196 barleys raised the question whether some general scheme of grading for sale would not be feasible. Mr. Cherry-Downes pointed out, however, that so different were the requirements of the buyers, and so various were the types of barley that could be brought into the same grade, that such a scheme would be unworkable, and this view was endorsed by other speakers.

Barley growers know only too well that the weather may defeat their best efforts to secure a good sample, but modern machinery has done something to meet the difficulty. Dr. Beaven put in a good word for combine harvesters on the ground that they picked up lodged crops very cleanly; and that the barley had to be left till quite fit before the combine got to work. In difficult seasons, however, there was still the possibility of artificial drying on the farm, a point that was taken up by several speakers. It is well known that drying barley on the farm has not been regarded with favour by the majority of buyers, many refusing to accept barley so treated. The Chairman announced that negotiations between representatives of the National Farmers' Union and the corn trade had come to a satisfactory agreement in this matter, and that, in future, it would only be necessary to state to purchasers that the barley had been dried on the farm. The drying of barley must be carefully controlled or it may be rendered useless for malting, and Dr. Denham, of the Institute of Agricultural Engineering, Oxford, detailed some of the precautions necessary.

In answering questions relating to the nitrogen content of barleys, Dr. Bishop suggested that valuation from external characters should be supplemented by chemical information of the grain, with the inside of which the brewer was chiefly concerned. Many of the farmers present were hard hit by the poor demand for home-grown barley of ordinary grade. It was pointed out from the technical side that the

NOTES FOR THE MONTH

extent to which such barley could be used was controlled by the type of beer at present in demand, and the effect of the excise regulations. Heavy gravity beer using much barley would be expensive.

The barley problem is far from a simple one, and the first step towards its solution must be an appreciation by all parties of the viewpoints of the various interests concerned.

The Food of the Stock Dove

As a matter of interest and record, Mr. Max Baker, of Clacton-on-Sea, Essex, recently forwarded to the Ministry the crop contents of two Stock Doves. Of one bird (immature), shot on October 5, 1934, he gives the following particulars:—

				oz.
Dead weight	..	..	..	6.0
Crop contents	..	..	..	2.2

The crop of this bird contained 166 germinated seeds of the tare, some with sprouts $\frac{3}{4}$ in. long, and 3 grains of wheat. The bird was shot on a field of recently-seeded tares, which is the local stand-by for sheep-feeding in the spring, since the white turnips and clover failed on account of the drought. The crop contents of the other Stock Dove, shot on September 14, disclosed 207 tare seeds and 14 grains of corn, the latter doubtless picked up from the stubbles and elsewhere.

The Stock Dove (*Columba oenas* L.) differs from the Ring Dove or Wood Pigeon (*Columba palumbus* L.) in having no white on the sides of the neck or on the wings, and the nuchal patch is of a green tint, while the vinous-purple of the breast hardly comes below the line of the shoulders. The lower parts are bluish-grey as in the Rock Dove (*Columba livia*, Gmelin) with which bird the Stock Dove is often confused. This confusion is aggravated by the fact that in many districts the Stock Dove is known as the "Blue Rock." The Stock Dove is smaller than the Wood Pigeon, an average length being less than 12 in. as against 15 in. or more for the latter.

Apple Packing

THE growing demand for well-graded and properly-packed apples has so influenced market conditions that the preparation of fruit for sale has become as important as cultivation itself. Nowadays nobody willingly buys the small blemished apples that are, each of them, an insult to a fruit that for long has held a world-wide reputation, and, consequently, supplies of low-grade apples can no longer be disposed of profitably. Growers who have neglected to keep pace with modern advances in production methods naturally find themselves at a disadvantage compared with their wiser rivals, and quite soon, even the ablest growers, if they do not make arrangements to present their fruit in a manner acceptable to the markets and the public, will discover that even well-nigh perfect cultivation is not enough.

The Ministry has devoted much attention in late years to investigating the preferences displayed by consumers and merchants—factors that are of paramount importance—and for a period the results of these investigations, as regards apples, were available in the Report on Marketing No. 21, *The Preparation of Fruit for Market, Part I*. This report has been out of print for some time, but the necessity and demand for authoritative advice still continue, and the Ministry has decided to re-issue the information as a Bulletin.* This Bulletin is a fuller and more detailed exposition of the various operations described in the earlier report, and, in order to facilitate the understanding of the intricate manual movements involved in apple wrapping, a series of specially posed “close-up” views has been prepared. A specimen from this photographic “slow-motion” record will be found opposite.

The publication deals, not only with the actual wrapping and packing, but also with those essential preliminaries to the marketing of good apples—thinning the orchard, the trees and the fruit, picking, grading and sizing—and throughout, by means of copious illustration, every endeavour has been made to furnish a guide that shall be practical above all else.

So that the information contained in the Bulletin may be as complete as the modern apple grower could wish, the

* Bulletin No. 84, *Apple Packing* Obtainable through a bookseller or from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s 3d (by post 1s 5d).



One of the intermediate stages in Apple Wrapping - an illustration from the Ministry's Bulletin No. 84 - Apple Picking

NOTES FOR THE MONTH

details of the National Mark Grades for Apples and of National Mark Packages for Apples have been included as appendices.

Warning against the Tar-marking of Sheep

THAT the tar-marking of sheep proves troublesome to the wool manufacturer has long been recognized; and the Ministry has consistently deprecated the use of tar for this purpose, particularly as other satisfactory and durable marking materials are available. These alternative materials, to supersede tar for sheep marking, have been produced as a result of several years' experimental work conducted by the Wool Industries Research Association, and their efficacy, from the farmers' standpoint, has been amply proved by tests both at home and abroad. There are two fluid preparations, the prescription for that to be used abroad differing from that of the fluid recommended for use in this country. The latter, known as 1928/1, is composed as follows:—

	<i>Parts by weight.</i>
Wool fat	150
Carnauba wax	10
Barytes	70
Colour	17 5
White spirit to consistency.	

Farmers in Wales and Hampshire, who have tried the home marking fluid, report that it quite fulfils their requirements as regards durability, and in remaining legible after a season has elapsed.

The Dominions fluid (1928/8) is a much more resistant preparation than that recommended for home use; but, as a matter of interest, it may be mentioned that cloth, manufactured from wool branded with this fluid, was examined by a Committee of the Bradford and District Manufacturers' Association, and the Committee expressed the opinion that nothing detrimental could arise from its use, "provided the marking is done in a similar way to that used in the tests, and that the processes of scouring are the same as those employed on the fabrics examined."

It should be noted that the authentic or guaranteed fluids, made to the formulæ of the Research Association, can be obtained only from duly authorized agents. Farmers, at home and abroad, who are interested, should apply for information and names of agencies to the Wool Industries Research Association, Torridon, Headingley, Leeds.

NOTES FOR THE MONTH

Agricultural Literature

THE literature devoted to agriculture and to the sciences to which agriculture is linked is now so extensive that even the experienced student or research worker finds it necessary to make increasing use of bibliographies and reading lists. By such means the onerous, and often time-wasting, task of selecting the most useful and suitable works is spared him, or at least reduced.

How much more complex must be the problem of the practical farmer or the general reader—the one ill equipped in time or training for bibliographical research, the other with a little leisure that is too precious to squander fruitlessly—may be gauged by the size of the modern agricultural library. For example, the Ministry's Library contains some 50,000 volumes; and there are other libraries that are still larger by reason of their longer foundation or richer endowments, or both.

To solve this problem in so far as it affects its own officers, the Ministry has for some years past issued, mainly for limited official circulation, a selected list of the modern works in English filed in its Library. This list has proved of considerable value, and it has therefore been decided to extend its usefulness by publishing it as a Bulletin,* thereby making it readily available to the general public.

The principle of selection has been that of tested usefulness, as indicated by the demands experienced by the Library staff during the past ten years. This ensures that the Bulletin's contents have been chosen, not from a pedantic standpoint, but in relation to the problems on which information is most usually sought. Every branch of agriculture is covered, and the publication is classified according to subject.

Progress in Timber Research

THE Annual Report of the Forest Products Research Board for the year 1933, which was recently published,†, records a closer contact between the Board and industry, as shown by the numerous inquiries received from industrial firms for information and advice on the qualities, strengths and suitability of timbers for specific purposes, such as the design of grain silos. There have, also, been applications

* Bulletin No. 78. *A Selected and Classified List of Books on Agriculture*. Obtainable through a bookseller or from His Majesty's Stationery Office. Price 6d. (by post 7d.).

† *Report of the Forest Products Research Board for the year 1933*. Department of Scientific and Industrial Research. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 1s. 3d. (post free 1s. 5d.).

NOTES FOR THE MONTH

for tests for industrial purposes, among them one on fibre-board egg cases.

Of interest to growers of willows is an investigation, now in progress, into the most suitable species of willows, varieties or hybrids, for making cricket bats, with the optimum soil conditions for their growth, and the silvicultural treatment necessary to ensure first-quality trees. This research has been undertaken in conjunction with the Imperial Forestry Institute, the Forestry Commission, willow growers and bat makers. The growth features of certain selected trees as well as the wood structure are being examined in detail, and mechanical tests are being applied to ascertain strength properties. It is hoped to establish some definite relation between the laboratory results and the opinions of players on the quality of the bats made from the timber tested. Bats are being made from material taken from six localities early in 1933, which was left to season throughout the ensuing summer and winter.

Researches into Dry Rot, damage to timber by various beetles, etc., were continued, and one interesting investigation during the year tends to disprove the commonly accepted belief that the expansion and contraction of timber diminishes with age.

Beet-lifting Machinery Demonstration in Norfolk

A DEMONSTRATION of beet-harvesting and other machinery was held at the Norfolk Agricultural Station, Sprowston, near Norwich, on Wednesday, October 17. There was an excellent attendance of farmers, and much interest was shown in the four types of machine that were demonstrated, viz., the Case Row Crop Tractor and Self-Lifting Four-Row Beet Plough; the Miller Two-Row Beet Plough working with Fordson Tractor and Miller Wheels; the A. P. H. Salleng Combined Beet Lifter, Cleaner and Loader (Danish); and the Desbonnet Combined Topper, Lifter, Cleaner and Loader (French). In another field a Gyrotiller was at work preparing a seed bed, and attracted much attention. A number of variety trials of different methods of cultivation of sugar-beet were also open to inspection.

Food Investigation

THE report of the Food Investigation Board for 1933*

** Report of the Food Investigation Board for 1933. Department of Scientific and Industrial Research. Obtainable from His Majesty's Stationery Office at any of the branches mentioned on the cover of this JOURNAL. Price 5s. (post free 5s. 6d.).*

NOTES FOR THE MONTH

reviews the research work on transport and food storage that has been conducted by the Department of Scientific and Industrial Research.

Reference is made to the demonstration, on a semi-commercial scale, that chilled beef can be held in perfect condition for as long as 60-70 days in an atmosphere containing 10-20 per cent. of carbon dioxide. Progress has been made in the study of this method of storage, both in the laboratory and in experimental shipments. Provided the necessary gas-tightness can be secured in ships' refrigerated spaces, the method should enable Australia and New Zealand to transport beef to this country in the chilled state. Under existing conditions chilled beef from South America must be carried at a temperature that involves the formation of a small amount of ice. The use of carbon dioxide will enable the temperature during carriage to be raised so as to avoid this undesirable circumstance. Experiment has shown that mild-cured bacon can be stored in an atmosphere of carbon dioxide for 18 weeks at 0° C. without deterioration. Bacon has also been preserved in excellent condition for 8 months at a temperature of -3° C. (26.6° F.) and at -10° C. (14° F.).

Further progress is reported in the commercial gas-storage of apples, in which the amount of carbon dioxide in the atmosphere is increased with corresponding diminution in the amount of oxygen. A detailed explanation of the system appeared in an article entitled "The Storage of Apples" by Dr. C. West, in the September, 1931, issue of this JOURNAL. Last year, 7 new gas stores were completed in England, making a total of 12, and others are in course of construction. Trials have demonstrated that, while gas-storage retards the development of the characteristic flavour of Cox's Orange Pippin, it does not destroy it. Special attention is now being devoted to the effect of temperature and other factors in the development of flavour in the apple after removal from gas- or cold-storage.

Work of practical value to British shipping is being carried out in the experimental ship's hold at the Ditton Laboratory. With this equipment it has been possible to determine the relative value of various methods of dunnaging cargoes, to evaluate such important biological constants as the thermal capacity of a stack of apples, the rates at which it generates heat and carbon dioxide, and to study on a semi-commercial scale the transfer of heat from fruit to air and from air to pipes.

NEW SLUICE AND PUMPING STATION AT ST. GERMANS

ON two previous occasions, in October, 1929, and December, 1931, this JOURNAL has contained illustrated notes descriptive of drainage works in progress in the Middle Level District of the Great Ouse Catchment Area. These works comprise the erection of a new sluice and pumping station at St. Germans, where the main drain of the Middle Level has its outfall into the Ouse. On September 28 last this sluice and pumping station were formally declared open by the Minister.

As the completion of these works, which are on a most impressive scale, forms a landmark in the history of fen drainage, and involved the design, manufacture and installation of pumps that are certainly the largest ever used in this country and probably in the world, some further record of the achievement may be of interest.

The sluice itself is a massive structure in reinforced concrete, and contains two eyes each 35 ft. wide, compared with three apertures each 17 ft. wide in the structure which it has replaced. Both abutments contain engine houses, the north one housing two pumping units and the south one a third pumping unit, space being available there for a fourth unit when required. The engines, which run on crude oil, are each 1,000 B.H.P. Crossley-Premier, Vis-à-vis type with 8 cylinders having a bore of 18 in. and a stroke of 26 in. Full auxiliary equipment, including electrical controls, is provided.

The pumps were designed and constructed by Gwynnes Pumps, Ltd., and are, as stated above, of exceptional interest and capacity. They are 102 in. in diameter, and fitted on the suction side with two inlet pipes each 7 ft. in diameter, with appropriate flumes. On the delivery side there is an electrically-operated sluice valve 102 in. in diameter and weighing about 38 tons, each pump being capable of lifting up to 1,000 tons of water a minute.

Each drainage eye is provided with outer and inner sluice gates of vertical lift 60 ft. apart. When discharge is by gravitation all the sluice gates are raised, but when

NEW SLUICE AND PUMPING STATION, ST. GERMAN'S

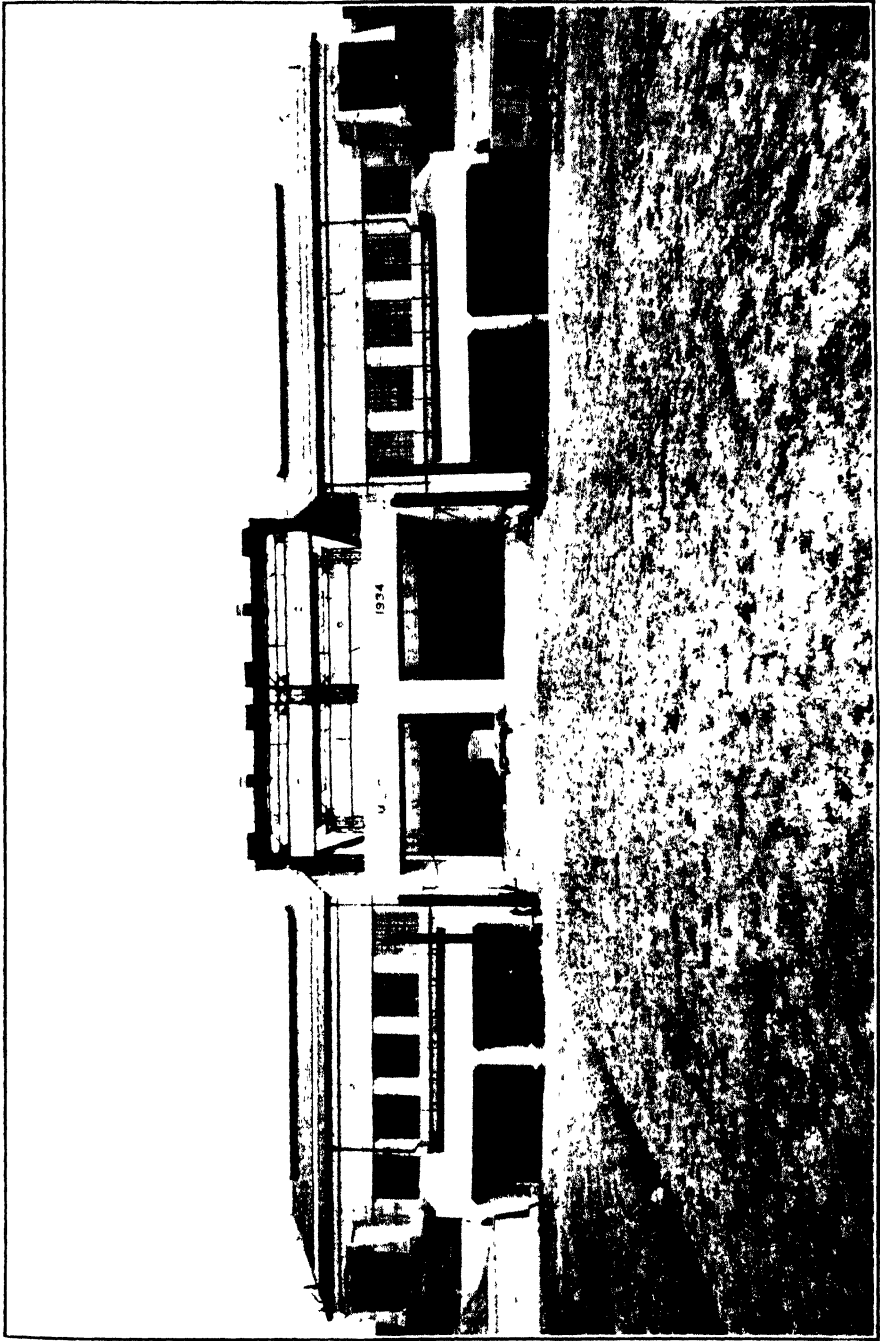
pumping is in operation the outer or tidal gates are open and the inner gates closed.

The history of events that have led up to the present works may be sketched very briefly as follows. Up to the middle of the 17th century, when the Duke of Bedford undertook the drainage of the Great Level of the fens, the whole area must have been little more than a waterlogged waste. Sir Cornelius Vermuyden, a Dutch engineer, designed and carried out the works.

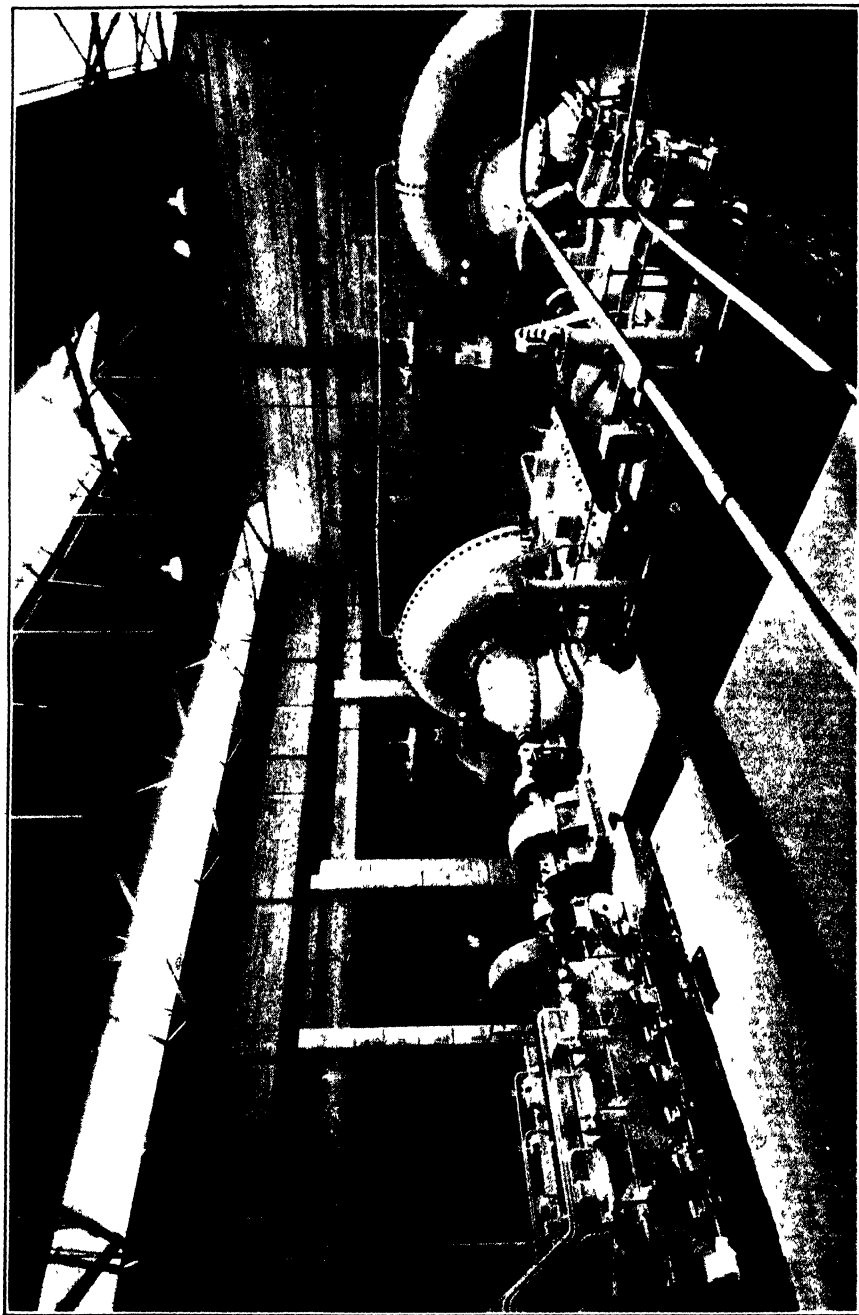
He first cut the Old Bedford River from Earith to Denver, and later, when this was found to be inadequate, the New Bedford, or Hundred-Foot River, parallel to it. These rivers were embanked so as to form one huge wash 21 miles long. One of the many other drains that he cut is to this day known as Vermuyden's or Forty-Foot Drain. Besides these works of drainage proper, a great number of public and private highways were made, forelands were set out, and bridges constructed.

The Middle Level is that part of the Bedford Level between the Nene and the Ouse in the counties of Norfolk, Isle of Ely and Huntingdon, and contains about 123,000 acres of perhaps the richest agricultural land in England. As left by Vermuyden, the outfall was through Salter's Lode sluice, some miles above the present outfall at St. Germans, but the natural shrinkage of the fen land, which consists of peat over clay, gradually rendered this outfall ineffective and a new one had to be found at a lower level. In 1847, the first St. Germans sluice was built at the outfall of a new main drain four miles above King's Lynn, involving some re-orientation of the Middle Level drainage system, which has not been changed since. In 1862, this sluice was destroyed by a combination of adverse circumstances, and, through a breach in the bank of the Main Drain, 9,000 acres were inundated by tidal water. This disaster was dealt with by Sir John Hawkshaw, who erected a dam near the site of the destroyed sluice with sixteen syphon pipes over; this served its purpose until 1875 when he commenced the erection of the second St. Germans sluice alongside the old channel, and then diverted the main drain through it in a loop.

Continued shrinkage of the land has rendered the St. Germans outfall less and less effective, and gravitation alone



Copyright P. Goodchild



Engines and pumps in the north engine house at St. Germans

Copyright P. Goodchild

NEW SLUICE AND PUMPING STATION, ST. GERMANS

no longer provided fully effective means of getting the surplus water away. This was beginning to be realized before the War and on a number of occasions inundation again appeared to be imminent—not, however, on account of a break-through of the tide, but by reason of the overflowing of the drains, which could not discharge their water as rapidly as safety demanded.

A further reason for this state of affairs was to be found in the unsatisfactory condition of the Ouse outfall channel to the sea; this channel had deteriorated greatly during the troublous time before the old Bedford Level Corporation was superseded by the Ouse Drainage Board (now itself superseded by the River Great Ouse Catchment Board). This further hampered the discharge of Middle Level waters by gravitation, while the amount of water to be discharged was augmented by the zeal of the smaller drainage authorities, who, each looking after its own fen, had installed much more powerful and effective pumping plants, so adding to the strain imposed upon the great main drain. It was not until 1928, however, that, with a grant of public money from the Unemployment Grants Committee, it was decided to erect the new combined sluice and pumping station on the site of the straight line of drain abandoned in 1875.

The Government grant in respect of the work took the form of 75 per cent. of the charges on a loan of £225,000 for the first half of the loan period of thirty years, and 37½ per cent. of the charges during the latter half of the period, on condition that 75 per cent. of the labour consisted of men from the distressed mining areas.

Many engineering difficulties were encountered, particularly in the preliminary excavations and in the construction of the foundations, the latter consisting of some 1,300 reinforced concrete piles driven to a depth of over 40 feet; on these piles a solid concrete bed was superimposed. The provision of accommodation in a hutted camp for the 150 to 180 men employed was itself no mean feat of organization. The engineer of the Middle Level Commissioners, Major R. G. Clark, M.Inst.C.E., who has been in supreme charge of the operations, may well congratulate himself on their successful completion. He has been ably assisted by the resident engineer, Mr. David Hill, Assoc. M.Inst.C.E., and his assistants.

NEW SLUICE AND PUMPING STATION, ST. GERMANS

Quite apart from this scheme, the Middle Level Commissioners have undertaken concurrently a number of other drainage works within their area; these works are for the strengthening of barrier banks and the improvement of their main drains, and will cost an additional £245,000, towards which the Government will have advanced £131,000 in grants.

It is very satisfactory to know that agriculture in this highly fertile district will have in these works—in conjunction with the new sluice and pumps—a very valuable additional safeguard against those ever active forces of nature to which, since the 17th century, the resources of man have been continuously opposed.

A COMMERCIAL APPLE-SPRAYING DEMONSTRATION IN 1933

W. G. KENT, N.D.H.,

*Advisory Officer in Commercial Fruit Growing,
Kent County Council.*

IN an account* of an apple-spraying demonstration in Kent, in 1932, the conclusion was drawn that satisfactory control of apple Scab could be secured, under farm conditions, in less time, and at less cost, than is common in commercial practice. To test the accuracy of this conclusion, it was decided to repeat the demonstration in 1933, the Ministry, as in 1932, making a grant to meet part of the cost.

Preliminary Details.—The kindness of Mr. H. Payne, Court Lodge Farm, West Farleigh, near Maidstone, in giving every facility for the demonstration, and in permitting (as in 1932) the use of his 6½-acre Bramley's Seedling orchard and 4-h.p. spraying plant, is here gratefully acknowledged. As before, the 303 rather large trees (24 to 30 ft. spread) were divided into two plots, one for spraying with Bordeaux mixture and the other with lime-sulphur. In each of the sprayed plots, 15 trees (the same individual trees as in 1932), in two groups of 8 and 7 trees, respectively, were left unsprayed as controls, so that 136 trees received lime-sulphur, and 137 trees Bordeaux mixture.

Winter Spraying.—On account of the presence, in 1932, of some apple Capsids, and of a small amount of Rosy Aphis, it was decided to spray all the trees (including those to be left unsprayed in the apple Scab demonstration) with mixed tar-petroleum washes. This was begun on January 31 and concluded on February 3, after interruptions due to rain and frost. Part of the work was done under good conditions, and part while there was considerable wind. Three different brands were used, these showing marked differences in ease of handling and in the quantities required to give complete cover. With one brand, the concentrate was so viscid that an extra man was needed for

* This JOURNAL, Vol. XL, No. 5 (August, 1933), pp. 420-430.

APPLE-SPRAYING DEMONSTRATION, 1933

mixing, and it required fully 14 gal. of spray fluid to cover each tree. Another brand, of somewhat lower oil content, mixed extremely like an ordinary tar-oil wash and covered satisfactorily at the rate of 10 gal. per tree.

The rather small capacity and moderate pressure of the spray outfit, combined with the lack of spreading power of the washes, made the work tedious and difficult. Five men, including one solely engaged in mixing, took $2\frac{1}{4}$ days to spray the 6.3 acres, costing about £3 15s. in labour, or about 12s. per acre. The labour cost for the better-spreading wash worked out at about 9s. 5d. per acre.

First Scab Spraying.—The first Scab spraying was carried out on April 10 in dull and cloudy weather, under calm conditions or with a light breeze from the S.W. The sprays were made up as follows:—

<i>Bordeaux Mixture.</i>			<i>Lime-sulphur.</i>		
Copper sulphate ..	..	3½ lb.	Lime-sulphur ..	..	1½ gal.
Hydrated lime ..	..	5 lb.	Lead arsenate paste ..	..	26 oz.
Lead arsenate paste ..	..	26 oz.	Water to ..	..	40 gal.
Water to ..	..	40 gal.			

The outfit was drawn up and down the rows of trees by tractor, the men preferring this method to the use of overland Merryweather pipes, though no gain or loss of time was involved. Two men sprayed, using 10-ft. lances, with "Mistifier Junior" nozzles, fitted with 7/64-in. discs and adjusted to give a rather narrow driving spray. Each nozzle had an output of slightly less than 3 gal. per minute, and the pump could only just supply two of these. One man drove the tractor, refilled the tank from tubs supplied with water by overland pipes from the main, and mixed the wash, except when lead arsenate paste or Bordeaux mixture was used, when extra help was required. These three men can, except when the mixing is troublesome, spray 6 acres every day in this way, in spite of the fact that the small 80-gal. tank necessitates spending a large proportion of the time in refilling. About $5\frac{1}{4}$ gal. of each wash was applied per tree, and the 30 control trees were sprayed with lead arsenate wash alone on the same day.

The state of the buds might have been considered rather advanced for the first of two pre-blossom sprayings, but circumstances had delayed commencement. The blossom buds were green, being still covered by the calyx, or with the centre blossom showing colour. The leaves around the blossom trusses were fully expanded and were free from

APPLE-SPRAYING DEMONSTRATION, 1933

Scab. For the whole of the previous fortnight the weather had been unusually hot, and in the absence of rain there was every prospect that the first spraying would be in good time to precede any early infection and so would be truly protective.

In contrast with the spring of 1932, dead, overwintered leaves were very numerous in the grass and were in a good state of preservation. Many of those examined, after random sampling over the whole orchard, were entirely free from Scab, but a large proportion contained perithecia of the Scab fungus with ripe ascospores.

Second Scab Spraying.—The second Scab spraying was completed on April 18 after an interval of fine weather. No lead arsenate was included, but otherwise the sprays were as used for the previous spraying. A cold N.E. wind was blowing in gusts, with calm periods; there was occasional sunshine with grey and white clouds. In applying Bordeaux mixture at this and the two later sprayings, "Noblox" double nozzles were employed, these being fitted with No. 3 discs and No. 2 vortex adjustment. As used they had an output of slightly below 3 gal. per minute each but broke up the spray more finely than the "Mistifier Junior" nozzles did at this output, so that the trees could be sprayed somewhat more lightly in an endeavour to minimize possible Bordeaux injury. Hence, less Bordeaux mixture per tree was used after the first spraying than was the case with lime-sulphur.

All the trees were in the advanced "pink bud" stage, sometimes with the centre blossom of the truss about to open, or with all the buds still closed. Except on a few trees here and there, no flower was actually open. No fresh foliage had expanded, and since the truss leaves were already covered with spray deposit and no Scab was present, it appeared that the present spraying might almost be unnecessary. The leaves of the control trees were similarly healthy.

Third Scab Spraying.—The third Scab spraying was commenced on May 9, when there was a strong and cold gusty wind from the S.W., and a dull sky with grey clouds. The lime-sulphur plot was sprayed first, using a strength of 1 in 60 on some 30 trees, as the leaves were still wet after early morning rain. Later (9.45 a.m.), when the

APPLE-SPRAYING DEMONSTRATION, 1933

foliage had become dry, a concentration of 1 in 80 was used. Rain fell when the last 4 trees of this plot were being sprayed, and it undoubtedly removed some of the deposit. Sunny conditions followed at 2.35 p.m., and the Bordeaux spraying was begun. This, however, had to be discontinued owing to further rain after 20 trees had been sprayed. On the following day, in spite of slight rain and a dull cloudy sky, the whole of the Bordeaux plot (including the 20 trees just mentioned) was sprayed with Bordeaux mixture.

From some of the trees all the petals had fallen, but on others a few flowers remained; some were very late and were only just passing full bloom. Before this spraying, the leaves surrounding the blossom trusses were already well covered with spray deposit and required no more; fresh leaves had developed, however, on the non-bearing spurs (about 4-5 leaves), and on the new short wood growths, now carrying about 8 leaves, only two of which showed any deposit from former sprayings. The quantity of new wood shoots and fresh foliage was not great, probably because the trees were flowering very freely.

Perhaps, as the result of recent rains during the blossoming period, the first small attacks by Scab had developed; these were on most of the trees in two of the four control groups. The grass in the orchard had been cut, but was at this time nearly six inches long, and concealed numerous dead leaves of the previous season which were found to bear perithecia with ripe ascospores. Damage by the two pre-blossom sprayings was present only on the Bordeaux plot, where a scorch effect was shown by purple spotting on the leaves around the blossom trusses and on the lowest two or three leaves of the wood shoots; these leaves were also slightly curled.

Fourth Scab Spraying.—Good conditions prevailed for the fourth Scab spraying on May 22, there being only a slight breeze, from the N.N.E., while the lime-sulphur (at a strength of 1 in 100) was applied, and complete calm in the afternoon while the Bordeaux mixture was put on. Observations made on this date before spraying took place showed that the new wood shoots were about 6 in. long with 9 leaves, all of which except the youngest two were covered with spray-deposit. Non-bearing spurs, with 5 leaves, were already well sprayed. It was plain that the fourth applica-

APPLE-SPRAYING DEMONSTRATION, 1933

tion was not urgently needed, on account of the small amount of fresh foliage, but it was made in good time as it was feared that some of the lime-sulphur had been washed off soon after the previous application a fortnight earlier. The trees in the lime-sulphur plot were all very healthy and only rarely were a few leaves found attacked by Scab. In one instance, the fungus was powdery and producing spores profusely in or on the spray deposit on the upper surface of a leaf.

In the Bordeaux plot, the spotted and curled condition of the blossom truss leaves was immediately noticeable. Spray damage on many of the new wood shoots was occasional rather than general; the lower 5 leaves showed purple spotting, and the remaining 4 (only lightly sprayed or not sprayed) were unaffected. No Scab was present.

A general attack of Scab, not yet severe, was progressing in the control plots. Single spots of recent infection were present on non-bearing spur-growth leaves and, sometimes, on 6 of the 8 leaves of the new wood shoots. This development of the fungus must have taken place during the previous fortnight. It was fairly common, and could be found on any branch of all the trees, providing a great contrast with the healthy condition of the sprayed plots. It was noteworthy that the blossom truss leaves generally were not infected. One fruitlet was found attacked by Scab.

The grass in the orchard had just been cut. Dead leaves with perithecia were present, but very few asci were healthy. They were yellow in colour and spores were not readily ejected in water.

Summer Observations.—A visit to the orchard on August 1, after the exceptionally hot and dry months of June and July, showed that the apples had grown to an average diameter of $2\frac{1}{2}$ in. The trees on the lime-sulphur plot were healthy and it was estimated that 98 per cent. of the fruit was clean. The apples had a smooth green skin with no dullness such as was found in the Bordeaux plot. No russetting had resulted from the spraying, but corky rings round the eye of many apples were present as the result of frost early in the season. The foliage was green and healthy and leaf-curl and leaf-drop were not found, the trees appearing to have more foliage than those in the Bordeaux plot.

Spray injury in the form of purple spotting of the leaves

APPLE-SPRAYING DEMONSTRATION, 1933

was common in the Bordeaux plot, and the whole leaf-blade of one of the 5 or 6 leaves of every non-bearing spur was conspicuous by its bright yellow colour. The lowest leaf of the new wood shoots was also sometimes yellow in colour, and a few leaves had fallen to the ground. The trees thus looked less healthy than those of the lime-sulphur plot, and presented an autumnal appearance with scantier foliage. A few apples were slightly or badly "russeted," the damage extending occasionally over half the surface of the fruit. Brown "frost rings" affected a proportion of the crop. No Scab was found on this plot.

In the control plots, Scab infection varied in different trees from 50 to 70 per cent. of the fruits, and "frost rings" were also present. On the fruit, the places of Scab infection were brown and corky and were either large (up to $1\frac{1}{4}$ in. diam.) or very small (about $1/16$ in. diam.). The fungus appeared rather dried up and it was judged that infection had probably mainly occurred about a month previously. The foliage at first sight appeared green and healthy, but closer inspection showed that nearly every leaf was spotted with Scab, the places of infection often being brown where the tissues of the leaf were killed from one surface to the other. The fungus, however, was inactive and dried up in the hot weather.

Grading.—The sprayed plots were too large for grading the whole of the crop from them. Hence a block of trees was selected adjacent to each of the 4 control groups, and the entire crop from these was graded. Thus when 8 or 7 trees formed an unsprayed plot, the whole of the crop from either 8 or 7 trees was used for comparison. The fruit was picked on September 14 and 15, and the apples graded by hand for the amount of Scab present. Those entirely free from the disease, or having an area of Scab not exceeding that of three pins' heads (i.e., 3 areas each of 2 mm. diam.) were included in Grade 1; those with more Scab than this were placed in Grade 2.* No apples were found so severely attacked as to be placed in Grade 3, i.e., so cracked or disfigured by Scab as to be unmarketable. The figures obtained are set out in Table 1.

Labour and Materials Used, and Costs.—The quantities of spray fluids used, the costs of materials, the number

* This system of grading is that adopted in all Scab-spraying experiments at Wye College, and defined in this JOURNAL, Vol. XXXIII, April, 1926.

APPLE-SPRAYING DEMONSTRATION, 1933

TABLE 1. BRAMLEY'S SEEDLING, 1933.

Treatment of Plot	No. of Trees	No. of Apples	No. in Grade		Percentage by number in Grade		No. of Bushels	No. of Bushels in Grade	
			1	2	1	2		1	2
<i>Bordeaux Mixture:</i>									
Upper plot	8	3,225	2,991	234	92.8	7.2	27½	25½	2
Lower plot	7	3,947	3,576	371	90.6	9.4	38½	34½	4
<i>Lime-sulphur:</i>									
Upper plot	7	4,434	3,869	565	87.3	12.7	36	31	5
Lower plot	8	5,134	3,801	1,333	74.0	26.0	38	28	10
<i>Unsprayed:</i>									
Upper—Bordeaux	8	4,890	789	4,101	16.1	83.9	32½	6	26½
Lower—Bordeaux	7	3,465	454	3,011	13.1	86.9	25½	4	21½
Upper—Lime-sulphur	7	4,612	1,073	3,539	23.3	76.7	37	9	28
Lower—Lime-sulphur	8	5,398	727	4,671	13.2	86.8	36	5½	30½

of men and of hours worked, and the costs of labour, are set out in Table 2. In comparing the costs of lime-sulphur with Bordeaux mixture, 3s. 11d. must be deducted from the latter for the spray wasted on May 9.

The total cost of the Scab sprayings, £13 17s. 7d., works out at £2 8s. 10d. per acre, as against a cost, in 1932, of £3 4s. 7d. per acre. The lower figure for 1933 is due, to the extent of about 3s. per acre, to the lead arsenate being included (in 1933) in only one instead of two of the fungicidal sprayings. Some 4,870 gal. of fungicides were applied in 1933, as against 5,185 in 1932, in which year an extra application of 530 gal. was necessary to replace spray washed off by rain. Fungicidal materials in 1933 cost in all £1 os. 6d. less than in 1932, mainly due to the omission of spreader which had cost 18s. in the previous year. The labour cost per 100 gal. of wash applied in 1933 was 2s. 0½d., against 3s. 0½d. in 1932, this accounting for some 8s. 8d. per acre of the 1933 saving in costs. The spraying in the later year was all done through large-capacity nozzles, whereas in the previous year the nozzles for the first spraying were of small capacity, subsequently increased progressively.

The winter wash at £6 12s. 7d. per acre was an expensive one. The varying quantities used per tree may account for the diverse views expressed as to the cost of one spraying with a mixed tar-petroleum wash compared with the cost of two separate sprayings with a tar oil and a petroleum oil

APPLE-SPRAYING DEMONSTRATION, 1933

TABLE 2. COSTS OF SPRAYS, 1933.

WINTER SPRAY									
								Costs.	
								£	s. d.
Date.									
Jan. 31 to	3,810 gal. at 10 or 12½ per cent.—								
Feb. 3	Cost of material							38	2 0
	Labour—5 men, 2½ days							3	15 0
Total								41	17 0
Per acre								6	12 7

SCAB SPRAYS									
								Costs.	
								£	s. d.
Date.									
April 10	Lime-sulphur.								
	720 gal.—								
	22 gal. lime-sulphur ..	1	7	6					
	36 lb. lead arsenate	1	7	0					
	4 men, 5½ hours	16	8						
April 18	570 gal.—								
	17 gal. lime-sulphur ..	1	1	3					
	3 men, 4½ hours	11	4						
May 9	670 gal.—								
	9 gal. lime-sulphur ..	11	3						
	3 men, 5½ hours	13	1						
May 10									
May 22	660 gal.—								
	7 gal. lime-sulphur ..	8	9						
	3 men, 5 hours	11	11						

Totals ..				£7	8	9				
				£6	8	10				

spray respectively. Assuming that an ordinary tar-oil wash could have been applied effectively at the lower rate (10 gal. per tree) at which one of the mixed washes was actually used, such a winter spray at 6 per cent. strength would have cost about £2 3s. 6d. per acre, plus 9s. 5d. per acre for labour. Since petroleum-oil sprays, separately applied, spread very readily after a tar-oil wash in the same season,

APPLE-SPRAYING DEMONSTRATION, 1933

it is possible that good cover might be secured by $\frac{3}{4}$ (320 gal. per acre) of the quantity of tar-oil, costing, at 6 per cent. strength, £2 8s. 0d. for material and 6s. 4d. for labour per acre. The cost of two separate applications, on the basis here postulated, works out at £5 7s. 3d. per acre for labour and material, against the £6 12s. 7d. of the Demonstration, the £6 9s. 5d. of the better-spreading wash, and the £7 11s. 5d. of the viscid wash.

Discussion of Results : Winter Wash.—This appeared to have served adequately the purpose for which it was used, as attacks by apple Capsids and Rosy Aphis were negligible. It caused some loss of fruit buds, and this point, as well as the question of cost, might lead one to prefer the two separate applications mentioned above.

Bordeaux Mixture.—The unsprayed trees in the upper half of this plot gave 16.1 per cent. of healthy apples, while the sprayed trees adjoining gave 92.8 per cent., an increase of 76.7 per cent. In the lower part, the sprayed trees, with 86.9 per cent. of healthy apples, gave an increase of 73.8 per cent. over the unsprayed trees.

Lime-sulphur.—The unsprayed trees in the upper half gave 23.3 per cent. of healthy apples, while the adjacent sprayed trees gave 87.3 per cent., an increase of 63.0 per cent. In the lower part the sprayed trees, with 74 per cent. of healthy apples, gave an increased percentage of 60.8 over the unsprayed trees.

These results bear out those of 1932. The attack of Scab was more severe than in 1932 (83.4 per cent. Grade 2 apples on the unsprayed trees as against 73.4), but the sprayed fruit was more free from Scab (85 per cent. against 81 per cent. in 1932). The costs, nevertheless, were less than in the earlier year. Bordeaux mixture again gave cleaner fruit than did lime-sulphur, but the observations on Bordeaux injury suggest that the use of large-capacity nozzles for this spray at normal strength, even on Bramley's Seedling, involves too great a risk.

Application.—The effective spraying of some 6 acres of mature half-standard apples per day by three men is not commonly achieved in commercial practice, but is shown to be fully practicable if large-capacity nozzles are employed.

APPLE-SPRAYING DEMONSTRATION, 1933

Crop.—The figures obtained do not show any significant difference in the crop. It is hoped to measure the effect, if any, on the crop of 1934, of the leaf injury caused by Bordeaux spraying in 1933.

Summary.—1. A winter wash to control apple Capsids and Rosy Apple Aphis, and four sprayings to control Scab, on $6\frac{1}{2}$ acres of large Bramley's Seedling apple trees, are described.

2. Observations on the development of apple Scab and on Bordeaux injury are presented.

3. Costs of the sprayings are given, with times required for application, the improvement over ordinary commercial practice indicated in 1932 being fully maintained.

4. Satisfactory control of apple Scab was again obtained, at even smaller cost than in 1932.

ACKNOWLEDGMENTS.—Mr. W. M. Ware made the biological notes on Scab and those on spray injury from which this record is prepared. To him and to two other members of Wye College staff, Dr. W. Goodwin and Mr. S. G. Jary, many thanks are due for their active co-operation. Mr. J. Turnbull (Ministry of Agriculture) again is mainly responsible for the costings, for testing rates of nozzle discharge, and recording quantities sprayed and times.

Thanks are also due to Messrs. Cooper, McDougall and Robertson, Ltd., Solignum, Ltd., and Wm. Butler & Co. (Bristol), Ltd., for washes supplied, and to Messrs. Drake & Fletcher, Ltd., for the loan of nozzles.

THE CONTROL OF VIRUS DISEASES OF THE TOMATO

JOHN CALDWELL, B.Sc., Ph.D.,

Rothamsted Experimental Station, Harpenden, Herts.

No complete information is available regarding the loss to the glasshouse industry due to the effects of virus diseases in tomatoes. There can be no doubt, however, that the amount of damage done is very great and that all available means should be adopted to reduce the incidence of these diseases to a minimum. The problem of virus diseases has received a great deal of attention for some years past, and much research has been carried out in various laboratories. The nature of the viruses themselves is still unknown, but many of the facts that have been established concerning the diseases they cause might with advantage be more thoroughly appreciated by growers and applied by them to the improvement of their crops.

In tomatoes, in this country, there are three common virus diseases:—Mosaic, Streak, and Spotted Wilt. In addition, there are two less commonly found—Aucuba or Yellow Mosaic and a peculiar type of Streak, caused by a mixture of Mosaic virus and a potato virus. If viruses exist in particulate form, as it seems most probable they do, then their particles are smaller than the smallest bacteria known, and they are, for the most part, very resistant to disinfectants and to the usual treatments that keep bacteria and fungi in check. Many viruses are carried from plant to plant by insects that live on the juices of these hosts. Viruses have, further, the curious property that they increase most rapidly in the most robust plants, and consequently the diseases they cause do most damage to well-grown plants. The multiplication of the virus depends very largely on the growth of the plant, and only in those plants that are growing rapidly is the virus actively increased.

Tomato Mosaic.—The ordinary tomato Mosaic that is most common in glasshouses is the least serious of the virus diseases of this crop. The symptoms are usually a more or less well-pronounced mottle on the leaves, with some leaf distortion. The fruit is not marked, or only slightly so, and the reduction of the crop is much less with this disease

VIRUS DISEASES OF THE TOMATO

than with the others. The virus causing it is known not to be carried by greenfly, but some of the smaller biting insects may possibly be carriers. It is not carried, as such, in the air or in the soil water. Some mechanical damage has to be done to the plant to ensure the entry of the virus, and it is readily transmitted by rubbing healthy plants with juice from diseased ones. This virus is indistinguishable in its effects from that which causes ordinary tobacco Mosaic—a very common disease in tobacco plantations. The tobacco Mosaic virus is unaffected by the process of curing and, being very resistant to ageing, is often present in manufactured tobacco. It is practically certain, that ordinary smoking tobacco is a common source from which tomato plants become infected. Tobacco juice on the fingers could easily cause the infection of a large number of plants during the process of stopping or tying up plants.

Streak.—Streak, as the name would imply, is a disease characterized by the appearance, on the stem and leaves of the tomato, of necrotic or dead areas. On the stem and leaf-stalks these are typically rather elongated, but such symptoms are not always evident. Under some conditions, not as yet fully comprehended, tomato Streak takes the form of a very mild Mosaic, usually not more severe than that due to the ordinary tomato Mosaic virus. The necrotic type of Streak causes very severe damage to the fruit, and consequently is the more serious form of the disease from a commercial point of view. It would appear that the disease very often spreads from plants showing symptoms that cannot be distinguished from those of the ordinary Mosaic type that have been ignored in "rogueing" at an early stage as being infected only with the much less serious ordinary tomato Mosaic. Severe loss of crop, however, follows on the setting in of the necrotic symptoms of Streak; and, since the cause underlying the change over to necrotic symptoms is not understood, their appearance cannot with certainty be prevented. The Streak virus is apparently able to infect plants other than tomatoes, and the writer has found in nettles and in horse-radish a virus that produces a disease in tomatoes indistinguishable from Streak. The virus is not carried by aphides, but there is some evidence that it is carried by Thrips. In all probability much of the disease in tomatoes commonly known as Stripe is identical with Streak, and is caused by the same virus.

VIRUS DISEASES OF THE TOMATO

Spotted Wilt.—Spotted Wilt of tomatoes is a disease more nearly resembling Streak than the Mosaics. It often leads at an early stage to a crippling of the whole plant, with very intense symptoms. It is probable that the disease, which is very prevalent in Australia, and which the records of the past couple of years seem to show occurs pretty generally throughout glasshouses in this country, has in recent years often not been clearly differentiated from Streak. Actually, the virus that causes Spotted Wilt, like so many others, induces a wide range of disease symptoms in a variety of different host plants, and thus its identity may not readily be appreciated. The symptoms range from those of Mosaics, as in Dahlia, to active necrosis, as in tomato. In the tomato fruit the disease is characterized by the appearance of large colourless and blotchy areas. The two viruses, that of Streak and that of Spotted Wilt, are easily distinguished in the laboratory, however, since the Streak virus will remain active in extracted juice for a long period, whereas that of Spotted Wilt is destroyed after exposure for a very few hours. The recognition of this fact should be of value in the control of Spotted Wilt, since it is clear that the virus must have living host tissue in which to persist and cannot remain long in an active condition on clothes, hands or in plant residues. The virus is easily transmitted by rubbing a healthy plant after a diseased plant has been touched. It is also transmitted by Thrips, and no evidence of the existence of other insect vectors has so far been produced.

Aucuba Mosaic and "Double-Virus" Streak.—These diseases are much less common in glasshouses than those just described. The first—Aucuba Mosaic—is characterized by the distortion of the leaves and the appearance on them of chlorotic areas that are bright yellow in colour. It is probably the most conspicuous of all the forms of Mosaic in the tomato. The virus is not transmitted by aphides, but, here again, there is evidence that Thrips may act as carriers. Although resulting from the action of two distinct viruses, one commonly found in potato and the other in tomato, Double-Virus Streak is indistinguishable from true Streak in the glasshouse. There is marked chlorosis and necrosis, the latter affecting more or less large areas of tissue. The disease can be transmitted from plant

VIRUS DISEASES OF THE TOMATO

to plant with the juice—on clothes, hands, etc. The fruits are pitted with necrotic spots.

General Properties of Viruses.—All these viruses, different as they are in some properties, have this in common, viz., they can develop only in living tissue and can enter a healthy plant only through a wound. This does not mean that a virus may not remain in dried-out plant tissues for a long period, for some viruses, as we have seen, can persist for a long time, e.g., that in "cured" smoking tobacco. It does mean, however, that the virus cannot multiply in the soil of the houses, or in corners of the walls, etc., and it also precludes the possibility of the virus spreading from plant to plant through the soil by movement in the soil water, or through the air by being carried in draughts, etc. This point is important, as there is an idea among some growers that the appearance of disease in plants near the doors of a house or under the windows is associated with the draughts that commonly occur there. Since the virus will not travel in the air or in the soil without the intervention of any other agency, some other means of transport must be sought. As we have seen, many viruses are known to be insect-transmitted and some are probably easily carried by some insect the activity of which is, as yet, unsuspected. Again, many viruses are unwittingly carried in the juice from diseased plants, on hands, knives, clothes, etc. In the process of tying up, disbudding, stopping, etc., therefore, the chances of infection taking place are very great.

Insect Vectors.—The problem of the transfer of virus from one plant to another by insect vectors is a very complex one, and one of the most difficult aspects is the question why a specific insect should be able easily to transmit one virus while it is unable to transmit another that seems, in properties, to be very like the first. Another question closely connected with this, is that of the ability of one insect easily to transmit a virus while an insect of a closely related type is unable to do so, or is able to do so but seldom. The control of certain virus diseases will probably be best tackled by keeping down the insect vectors, while other diseases, which are spread possibly by juice infection only, will need to be controlled by other measures.

The Source of Infection.—All the foregoing discussion presupposes the presence of a virus disease in a range of

VIRUS DISEASES OF THE TOMATO

houses. The important question is, therefore, where does the virus come from in the first instance? No healthy plant, completely isolated from infection, has yet been shown to develop the symptoms of any virus disease. All virus, therefore, must come from previously-diseased plants. How, therefore, does a new crop become infected? Some viruses do appear to be carried in the seed. This appears to be true of bean Mosaic and probably of cucumber Mosaic. There is so far, however, no conclusive evidence that this is true of the viruses that affect the tomato. During the past year, in the laboratory at Rothamsted, many thousands of seeds have been collected from diseased plants, dried, and sown under controlled conditions. In *not a single instance* have the seedlings developed symptoms of any virus disease, although they were grown on to the fifth to eighth leaf stage. Similar seedlings, artificially inoculated with the various viruses, did, on the other hand, readily develop the appropriate symptoms; and, when the inoculation was made at a very early stage, every leaf, on its appearance, showed disease symptoms. Inoculation in this case, was made very early in the seedling's life, because recent research has shown that the effect of the Mosaic viruses is to inhibit the formation of new chlorophyll by the plant, and not to destroy that which already exists in the plant at the time of inoculation. When inoculations were made into the very young primary roots, the whole plant became diseased. There was no evidence that any seedling was resistant to virus infection or that there was any delay in symptom expression in young plants.

Infection from Weeds, etc.—Since tomato viruses are not carried in the seed, each new crop must become infected from some outside source. The probable sources of infection are parts of old plants of the previous crop left lying about. While the virus cannot pass from these directly into the healthy plants, yet, if old plant tissues were handled before touching the young plants, infection could result. Another probable source of infection is the weed-crop that may readily occur round the houses, unless special care be taken. It has already been pointed out that a virus indistinguishable in its effects from that causing Streak was isolated from leaves of nettles and of horse-radish. It is more than probable that many other common weeds may carry this virus, either with or without symptoms. In any

VIRUS DISEASES OF THE TOMATO

case, solanaceous weeds are readily susceptible to infection by tomato viruses. The virus of Spotted Wilt is one of the worst in this respect, as it is catholic in its choice of hosts and can readily over-winter not only in weeds but also in plants kept under glass like Dahlias, Nasturtiums and Chrysanthemums, which are often grown between two crops of tomatoes.

Attention has already been drawn to the resemblance between the ordinary glasshouse Mosaic of tomatoes and the ordinary tobacco Mosaic. The latter disease is known in America to have been spread by workers who had been chewing or smoking tobacco, and steps have been taken to treat all cured tobacco used by the workers in the plantations. It is more than probable that smoking tobacco in this country is a fruitful source from which Mosaic in tomatoes arises. If one of the very common potato Mosais were introduced at the same time, the result would be the Double-Virus Streak.

The possibility of a virus being carried over in a hibernating insect must not be overlooked. No evidence has so far been offered on this point, but it may be that an insect that has ingested diseased material before the onset of winter remains infective in the following spring, if it managed to survive the intervening period.

Again, an insect may be responsible for the original infection, by migrating from an infected weed to the plants in the glasshouse. A highly suspicious instance of this kind was brought to the writer's notice some few years ago. A cucumber grower noticed, quite late in the season, that some of his cucumbers, up till then healthy, were showing signs of Mosaic. When the plants were examined it was noticed that only the topmost leaves of these plants, near the roof windows, were showing marked symptoms. It was suggested that the windows might have been more often open about a fortnight earlier than they had been during the previous part of the season, and this was admitted to be correct. The explanation of the grower was that the plants had "caught a chill," but this was rendered less probable when it was found that a hedge crossing the end of the range of houses was literally full of the wild cucurbit White Bryony showing the most marked Mosaic symptoms. The advice given then, and acted upon, was that careful removal of the Bryony would go far towards preventing infection in the future.

VIRUS DISEASES OF THE TOMATO

Recommendations for Control.—It is quite impossible to cure virus diseases in most types of plants and probably will remain so, although in a few cases (not tomatoes) virus-attacked plants have been found to throw off infection. At the best, after infection has taken place, even the most beneficial treatment of the plant can do little more than decrease the severity of the symptoms. It is very important, therefore, to prevent infection in the first instance. Some simple ways in which growers can reduce the incidence of infection, are, therefore, given below.

(1) The simplest and one of the most obvious precautions against infection is the removal of weeds from around the houses. It is not sufficient to assume that if weeds do not show symptoms they are not infected; even apparently healthy weeds should be considered as suspect. All plant remains, either of weeds or from the houses, should be burnt, and failing that, they should be heaped as far away as possible from the glasshouses.

(2) After weeding operations, the plants in the houses should not be touched until the hands have been properly washed. There is no need to use even a weak disinfectant in this process, because careful washing with soap and water completely frees the hands of virus.

(3) Smoking tobacco should not be used in the houses, or alternatively, should be rendered innocuous by heating in some form of container to 100° C. for a minute or two before use. This treatment will destroy any virus it may contain.

(4) At the beginning of the season, before tying or stopping has become necessary, all plants should be carefully examined. No plants should have been planted out that appear at all abnormal or sickly, and the examination should be primarily to rogue out those that have become accidentally infected at a later date. All suspected plants should be removed and destroyed. Before new plants are put in to replace those removed, the hands should be most carefully washed. *Most* of the infection of plants in tomato houses definitely takes place through thoughtless handling of infected and healthy plants one after the other.

(5) Lastly, routine fumigation should be carried out throughout the season, and care should be taken that the insect population of the houses be kept as small as possible. The corners and crannies where insects might hibernate should be cleared out as far as possible during the winter.

UTILIZATION OF POULTRY FEATHERS

Mrs. H. HODGES.

It is estimated that the number of poultry (including ducks, geese and turkeys) reared and slaughtered in England and Wales, now exceeds 36 millions annually. The quantities of feathers resulting from the plucking of this large number of birds are, of course, considerable, but a very high proportion of them is at present wasted. This is unfortunate in view of the many purposes for which they can be used, and having regard to the large imports of feathers for manufacturing purposes. Figures of imports, exports and re-exports are set out in the accompanying tables:—

UNITED KINGDOM FEATHERS—IMPORTS, EXPORTS AND RE-EXPORTS, 1930-33.

IMPORTS

	Amounts				Declared Values			
	1930	1931	1932	1933	1930	1931	1932	1933
	cwt.	cwt	cwt	cwt.	£	£	£	£
In or for beds, etc.*	125,082	137,531	127,863	108,090	533,581	468,899	376,489	271,126
Ornamental.—	lb.	lb	lb	lb				
Dressed								
(other than Ostrich)	†	†	†	†	53,522	111,693	69,317	
Undressed								
(other than Ostrich)	14,003	13 357	42,120	†	936	1,506	4,730	†

EXPORTS

	Amounts				Declared Values			
	1930	1931	1932	1933	1930	1931	1932	1933
	cwt	cwt	cwt.	cwt.	£	£	£	£
In or for beds, etc.*	7,363	5,301	3,559	†	89,555	66,477	23,653	†
Ornamental:—	lb.	lb.	lb.	lb.				
Dressed								
(other than Ostrich)	†	†	†	†	2,099	3,614	4,042	†
Undressed								
(other than Ostrich)	459	649	157	†	82	349	29	†

For footnotes to Tables, see under Table on the opposite page

UTILIZATION OF POULTRY FEATHERS

RE-EXPORTS

	QUANTITIES				DECLARED VALUES			
	1930	1931	1932	1933	1930	1931	1932	1933
In or for beds, etc.*	Cwt.	Cwt.	Cwt.	Cwt.	£	£	£	£
	1,549	1,725	1,890	†	13,103	10,029	12,538	†
Ornamental:—	lb.	lb.	lb.	lb.				
Dressed (other than Ostrich)	†	†	†	†	1,724	4,247	2,581	†
Undressed (other than Ostrich)	11,088	13,704	286	†	2,656	993	168	†

* The figures under this heading for the years 1930 and 1931 are not strictly comparable with those for 1932 and 1933. In 1932, the classification in the trade returns was altered to "Feathers for Beds," and in this year 1,476 "beds of feather or down" were imported, of a declared value of £378. Corresponding figures for 1933 are not available.

† Details not available

The duties now imposed upon the importation of feathers amount to 10 per cent. *ad valorem* upon bed feathers in bulk and 20 per cent. on others, and should serve to stimulate home production. Feathers may be divided into four main categories:—

- Down, the soft fluff that grows close to the body, particularly around the breast, as in geese
- Soft body feathers
- Quills, the stiff feathers found in wing and tail
- Immature, partly developed stubs or pin feathers

Down and other soft feathers are used largely in the manufacture of pillows, quilts, feather mattresses, cushions and similar articles, and also for purposes of upholstery. The millinery, clothing and fancy goods trades absorb large quantities. Feathers are in demand for making ornamental trimmings and bouquets, feather dusters, fishing tackle, shuttlecocks, pipe cleaners, artists' brushes, and many other articles.

Numerous firms of feather merchants and manufacturers are always ready to purchase supplies according to the requirements of their trade. Prices show slight seasonal fluctuation but are normally fairly uniform throughout the country. Some dealers in live and dead poultry are in the habit of buying small quantities of feathers from producers and bulking them for resale to merchants. Prices depend

UTILIZATION OF POULTRY FEATHERS

upon the grade, colour and condition of the feathers. White feathers are generally in better demand and secure higher prices than coloured ones. Soft body feathers are more valuable than quills. The highest prices are made by goose down, followed, in order of value, by the feathers of ducks, fowls and turkeys.

Prices ruling in March, 1934, were understood to be approximately as under:—

Body feathers:

Goose ..	..	..	1s. 2d. to 1s. 3d. per lb.
White duck	..	..	1s. per lb.
Grey duck	..	..	8d. to 9d. per lb.
Fowl	..	..	2d. „ 3d. „ „
Turkey	..	..	1½d. per lb.

Wing feathers:

Goose and duck	..	..	2d. per lb.
Turkey	..	..	1½d. „ „
Fowl	..	..	4s to 5s. per cwt

Selected feathers for particular purposes command higher rates.

English feathers have not, in the past, been esteemed in the trade so highly as those imported. This has been partly due to the lack of attention paid in this country to saving and marketing, which has led to the complaint that home-produced feathers have been more prone to dirt and impurities, and generally to be inferior in condition, as compared with imported feathers. It is important that feathers should be as clean as possible and kept dry. Feathers from each class of poultry should be kept apart. They should be divided into the following classes:—

- (1) Down (as regards geese).
- (2) Soft body feathers.
- (3) Quills.

It is generally desirable to pluck white and coloured body feathers into separate containers. Many birds, especially young ones, will be found, when plucked, to have a varying number of partly-developed growing stubs. These are soft and sticky and contain a good deal of liquid matter. They should be excluded from feathers designed for sale as they spoil the sample and lower the price. They are best utilized, with other rough feathers, for manurial purposes.

When plucking is carried out by hand, it is well to have separate receptacles available into which to pluck the

UTILIZATION OF POULTRY FEATHERS

different types of feathers. Where a plucking machine is used, its operation is confined to the removal of the body feathers. Quills and pin feathers are separately extracted by hand. Some machines have an arrangement whereby two bags are attached to hold the body feathers—one of these can hold white, the other coloured. Only one bag is filled at a time, and a lever diverts the stream of feathers to one or the other according to the plucker's choice.

Preparation for Sale.—It is not necessary to "cure" or otherwise prepare feathers intended for sale to feather merchants, as these have special equipment for the purpose and can carry out the work more efficiently than the ordinary producer. The Ministry of Agriculture has listed a number of firms desirous of buying poultry feathers and will furnish a list of these firms to any poultry keeper who requires it. The Ministry has also compiled a list of makers of fishing tackle. Their requirements are, however, more specialized than those of feather merchants. Merchants, generally, prefer to buy feathers in substantial quantities and many firms stipulate for amounts of not less than 1 or 2 cwt. There are, however, some who are prepared to purchase small parcels provided that they are sorted, graded, clean and dry.

In the sale of poultry feathers, co-operation should prove of value. It would take a small poultry keeper a considerable time to collect an appreciable quantity of any one grade, and he would thus be at a disadvantage in marketing them. There is scope for poultry keepers to combine and pool their feathers for despatch to merchants in the desired quantities. Such combination would secure an earlier return, as well as a saving in trouble of storage and cost of packing and transport. In addition, the feathers would probably reach the merchant in better condition.

Centralized poultry-packing stations should be in a particularly good position to utilize feathers to the best advantage. As they handle large quantities of birds, their supplies will be considerable; rapidity of sale and the marketing of commercially-desirable quantities should be assured. There are numerous ways in which such packing stations can make for increased efficiency in dealing with table poultry, and the sale of feathers to the best advantage ranks as not least among them.

UTILIZATION OF POULTRY FEATHERS

Goose-keeping for Feathers.—The rearing of geese specially for the production of down, feathers, and dressed skins, has never reached, in this country, the same stage of development as in France, where, for many centuries, it has been an important enterprise in the Poitiers districts. The feathers and down are plucked at different stages during growth, usually three times. When the birds are killed the feathers are plucked but the down left on the skins. The birds are skinned while still warm and the skins are hung up in the open air to dry for ten or fifteen days, after which they are packed and sold to manufacturers to be made up into so-called "furs," swansdown, powder puffs, etc. The carcasses are sold for consumption.

In former years, Embden geese were commonly bred in parts of Lincolnshire for the sake of their live down, and itinerant pluckers went from farm to farm to pluck the down. This practice has, however, declined.

Use for Manuring.—The rougher kinds of feathers are used for manurial purposes, principally in hop gardens and market gardens. The usual rate of application is 20-25 cwt. per acre. Feathers are slow in decomposition, and their effect upon the fertility of the soil is not rapid. The chemical composition of feather manure varies somewhat; an average sample would contain about 8 per cent. of nitrogen.

REPORT ON THE WORK OF THE EDUCATION AND RESEARCH DIVISION OF THE MINISTRY FOR THE YEAR 1932-33*

II.—AGRICULTURAL EDUCATION

THIS report relates to the first complete year (April, 1932, to March, 1933) during which the economy measures introduced in September, 1931, were operative. As explained in the previous year's report, these measures had hardly made themselves felt beyond their initial impact before the close of the financial year 1931-32; it is now possible to assess their financial result on a year's working and to draw some conclusion as to their effect in restricting or curtailing the different branches of work.

The principal measure taken by the Ministry in connexion with agricultural education administered by Local Authorities was the reduction of grants-in-aid of maintenance expenditure (as from October 1, 1931) to the uniform rate of 60 per cent.; previously the bulk of Local Authorities' approved expenditure had been aided at the rate of 66½ per cent., while certain items, such as the salaries and expenses of agricultural organizers and of some of the horticultural superintendents, were aided at the higher rate of 80 per cent. In addition, the Authorities were informed that only in the most exceptional instances would it be possible to aid any fresh developments involving capital expenditure, and that if such aid were given the rated grant would be 60 per cent., instead of either 75 or 66½ per cent., which, according to circumstances, had previously applied. As these measures were brought into operation on October 1, 1931, and thus applied only to half the year 1931-32, in order to judge of their full effect over a complete year it is necessary to compare expenditure in 1932-33, against the expenditure of 1930-31.

In this latter year the expenditure of Local Authorities on the maintenance of agricultural education had been raised to a new level in consequence of developments and expan-

* Part I of this Report, dealing with Agricultural Research (including Local Investigation and Advisory Work) appeared in the issue for last month (October).

EDUCATION AND RESEARCH REPORT.—II

sion of services to which they had been encouraged at the end of 1929, and it is reasonable to assume that but for the financial crisis of 1931 the expenditure of 1930-31 would have been maintained as normal in subsequent years. This expenditure was a total of approximately £369,000, on which the Ministry's grants were £247,500. In 1932-33 total expenditure by local authorities was reduced to £329,000, toward which the Ministry paid grants of £197,500. The economy measures therefore effected a saving by local authorities of £40,000, or 11 per cent. on the expenditure of 1930-31, and a saving in the Ministry's grant of £50,000, or 20 per cent. of the amount of grant paid in 1930-31. Practically all the authorities made cuts that were in some cases heavy, and in at least one instance went beyond what the Ministry thought necessary or even desirable; but as a general rule it may be concluded that the main structure of agricultural education administration has been left intact.

It could be assumed that a curtailment of expenditure of this order would represent small economies such as less travelling, fewer advisory visits, fewer demonstrations, in some instances the loss of a member of the staff or of part-time instructors, but not the loss of any essential service. This assumption is confirmed by the particulars in the detailed section of this report, given below. Indeed, some slight advance is recorded in relation to the Farm Institutes, where the numbers of courses and the total number of students have continued in 1932-33 the progress that has been noticed for several years; similarly with organized evening courses—though there was a slight drop in the number of such courses in 1932-33 as compared with 1931-32, the figures show a substantial increase on 1930-31. The numbers of students show a progressive increase, as they do also in evening classes.

On the other hand, instruction in manual processes, though a little in advance of 1931-32 in the number of courses arranged, is much below the level of 1930-31, and occasional lectures, meetings, etc., were fewer by 800 than in 1930-31. It is to be inferred that savings have been effected in occasional services and in those that are conducted mostly by part-time assistance; it may be added that more work was done by correspondence and less by advisory visits, which were 5,000 fewer than in 1931-32.

EDUCATION AND RESEARCH REPORT.—II

It appears, therefore, that the action taken in September, 1931, by which a useful sum was saved to the Exchequer in a period of national emergency, has not seriously impaired the main structure of county agricultural education; but it caused much useful and desirable work to be put aside for the time being.

The financial crisis of 1931 compelled also an all-round reduction, varying from 2 to 10 per cent., in the "block" maintenance grants to Agricultural Colleges (including University Departments of Agriculture) for the academic year commencing on October 1, 1931; this reduction effected a saving of £2,800, or 5 per cent. on a total grant of £55,700. Moreover, certain colleges lost the increase of grant that might have been awarded to them on the recommendation of the Reassessment Committee that reported in July, 1931. Capital developments at agricultural colleges, except the very few for which commitments had already been made, were postponed. Nevertheless, the number of students enrolled in 1932-33, though slightly below the total for 1931-32, was substantially above any enrolment figure for the previous four or five years.

A. HIGHER AGRICULTURAL EDUCATION AT UNIVERSITIES AND AGRICULTURAL COLLEGES.

(i) **Maintenance Grants.**—As explained in the previous year's report, the annual "block" grants to University departments and agricultural colleges, which it was intended to assess on a five-year basis, were due for revision in 1930; but the recommendations of the Reassessment Committee were not received until the summer of 1931. The financial crisis necessarily rendered inoperative many of the Committee's proposals. The grants of 1930-31 remained as a basis; but reductions varying from 2 to 10 per cent. were made as from October 1, 1931, and with only one exception these revised grants were paid again in 1932-33. The exception was Reading University; an increase at the rate of £1,000 a year was sanctioned for the establishment of a Chair of Horticulture at the University, but only half this sum became payable in the year 1932-33. Compared with 1930-31, therefore, the maintenance grants paid in 1932-33 show a reduction of £2,300.

EDUCATION AND RESEARCH REPORT.—II

<i>Institution.</i>	<i>Grant in respect of academic year.</i>		
	1930-31.	1931-32.	1932-33.
Armstrong College, Newcastle-upon-Tyne	£ 3,500	£ 3,400	£ 3,400
Cambridge University: School of Agriculture	6,500	5,850	5,850
Harper Adams Agricultural College*	4,000	3,900	3,900
Liverpool University (School of Veterinary Science)	2,850	2,700	2,700
Midland Agricultural College	3,000	2,850	2,850
Oxford University: School of Rural Economy	4,000	3,600	3,600
Reading University: Faculty of Agriculture and Horticulture	4,000	4,800	5,300
Reading University: British Dairy Institute	900		
Royal Agricultural College, Cirencester..	2,000	1,900	1,900
Royal Veterinary College	5,150	5,000	5,000
South-Eastern Agricultural College, Wye	4,000	3,700	3,700
Seale-Hayne Agricultural College	2,300	2,200	2,200
Studley College (for women)	1,000	950	950
Swanley Horticultural College (for women)	1,750	1,700	1,700
University College of Wales, Aberystwyth	7,000	6,800	6,800
University College of North Wales, Bangor	3,800	3,600	3,600
Leeds University	3,800	3,600	3,600
	£55,750	£52,950	£53,450

* (Grants of £2,450 and £2,575 were also paid to the National Institute of Poultry Husbandry at Harper Adams Agricultural College in respect of the financial years 1931-32 and 1932-33 respectively.)

(ii) **Capital Grants.**—The Ministry's commitments in respect of capital development, which in 1931-32 were £1,700, in 1932-33 were only £254. A sum of £104 was paid to Seale-Hayne Agricultural College as the final instalment of a grant towards the extension of the College dairy: the remaining £150 was a grant to Wye College in aid of interest charges incurred on a loan for the acquisition of the College farm. To these two items the Ministry was committed before the financial emergency placed a bar on further developments; apart from these small sums no other capital grants were made.

(iii) **Students.**—The following statement shows the numbers of students in attendance at institutions for higher agricultural (including veterinary) education during the past five years:—

1928-29	.. .. .	1,957
1929-30		1,896
1930-31		1,948
1931-32		2,064
1932-33		1,994

EDUCATION AND RESEARCH REPORT.—II

The numbers of students taking the different courses provided were as follows (in some instances students took more than one course):—

No. of Student

courses.

Subject of Course.

937	..	..	..	Agriculture.
270				Horticulture.
230				Dairying.
122				Poultry husbandry.
441				Veterinary science.
202				Miscellaneous.

Although the continuing depression in the industry and the financial crisis had their effect on the entries at certain of the institutions, it is surprising that on the whole the numbers were so well maintained. The number of veterinary students which in 1931-32 had shown a marked increase, was still further augmented in 1932-33.

B. AGRICULTURAL EDUCATION PROVIDED BY LOCAL AUTHORITIES.

(i) **Maintenance Expenditure.**—The following table shows the expenditure incurred by county authorities during the past seven years in maintaining their schemes of agricultural education, together with the amounts of grant-in-aid paid by the Ministry:—

Year	Expenditure			Grants		
	England	Wales	Total	England	Wales	Total
	£	£	£	£	£	£
1926-27	272,777	47,246	320,023	182,015	32,590	214,605
1927-28	265,705	45,664	311,369	177,989	31,529	209,518
1928-29	255,948	41,513	297,461	171,569	28,767	200,336
1929-30	261,838	40,614	302,452	175,480	28,175	203,655
1930-31	319,275	49,570	368,845	213,842	33,664	247,506
1931-32	309,730	50,603	360,333	194,807	32,563	227,370
1932-33	281,322	47,884	329,206	168,793	28,731	197,524

It should be mentioned that the increased expenditure in 1930-31 was due to extensions and improvements of their existing schemes, decided upon by the counties in response to the Department's circular letter of November, 1929. The decline both in expenditure and grants-in-aid observed in 1931-32 is accounted for by the economy "cuts" that began to operate towards the end of the year, and by the reductions in the rates of grant from October 1, 1931; the

EDUCATION AND RESEARCH REPORT.—II

further decline in 1932-33 shows the effect of these measures over a full year of operation.

Grants totalling £2,121 were also paid during 1932-33, to county borough authorities in aid of schemes of agricultural and horticultural education, and £315 to the London County Council in respect of evening classes in horticulture, bee-keeping and poultry-keeping, etc. The above-mentioned sum of £2,121 includes a sum of £341 paid to the Liverpool Corporation in aid of expenditure on an experimental course of agricultural training for unemployed youths conducted at the Corporation's hostel, which was previously used for training boys for work overseas.

(ii) Capital Expenditure.—A sum of £7,290 was paid during the year in question to three county authorities in England and Wales, in aid of capital expenditure on the provision and equipment of farm institute buildings, alterations, and adaptations, and the provision of a water supply. The items under this head were:—

- (1) £384 paid to the Kent County Council, being the final instalment of grant of £5,997 in aid of alterations and adaptations of the Borden Grammar School buildings for the purposes of a Farm Institute.
- (2) £141 paid to the Northampton County Council, being the final instalment of grant of £621 for the provision of an adequate water supply.
- (3) £6,765 paid to the Monmouth County Council in respect of a women's new hostel.

The authorities were contractually committed to these schemes before the financial crisis put a stop to capital developments.

During the year the West Sussex Authority negotiated the sale of a portion of the Kingsham Farm. Out of the proceeds the Ministry approved expenditure to erect certain farm buildings for the purpose of establishing a tubercle-free herd of cattle.

(iii) Courses of Instruction.—The following table gives particulars of the courses of instruction, lectures, etc., arranged by local authorities during the past five years. Of the 22,667 students who received some form of instruction in 1932-33, about one-third were women who were mainly taking courses in dairying, poultry-keeping and rural domestic economy:—

EDUCATION AND RESEARCH REPORT.—II

COURSES.

	1928-29	1929-30	1930-31	1931-32	1932-33
Farm Institute, etc., Courses.					
No. of Courses ..	87	102	111	133	174
No. of Students	950	1,120	1,415	1,618	2,056
Organized Day Courses					
No. of Courses	325	317	330	462	424
No. of Students	3,208	3,335	3,766	5,380	5,596
Evening Classes.					
No. of Courses	320	378	424	456	479
No. of Students	7,204	8,976	9,819	11,514	12,307
Correspondence Courses.					
No. of Courses ..	11	9	5	7	13
No. of Students	145	208	111	114	286
Instruction in Agricultural Manual Processes.*					
No. of Courses	398	440	421	265	297
No. of Students ..	3,432	3,503	3,795	2,288	2,422
Lectures, Demonstrations and Other Meetings.					
No. of meetings	9,364	10,185	11,281	10,617	10,465

* Ploughing, hedge-laying, ditching, thatching, sheep-shearing, basket-making, hurdle- and spar-making, milking, etc

The year 1932-33 showed a satisfactory increase in the number of students who received organized instruction in agricultural subjects; and with the exception of organized day courses, the numbers of courses also showed an all-round increase.

It is also satisfactory to note the rising number of students attending Farm Institute courses. Most of these Institutes have been quite full, and in some instances recourse has been made to outside residential accommodation where conveniently available. In Essex, for example, the Authority has acquired a larger house in Chelmsford to serve as a women's hostel; the house previously occupied proved quite inadequate to the number of women students.

(iv) Scholarships.—During the year under review 1,353 agricultural scholarships were awarded by local authorities, the total cost involved being £22,550. The corresponding figures for the previous year were 1,659 scholarships and £24,696.

(v) Staff and their Advisory Work.—Of the 62 Administrative Counties in England and Wales, 4 (Hunts, Isle of Ely, Isles of Scilly and Soke of Peterborough), do not employ Agricultural Organizers. In the remaining 58 counties, 54 Organizers are employed. The Professor of Agriculture at Leeds University acts as Organizer for the

EDUCATION AND RESEARCH REPORT.—II

three Ridings of Yorkshire; and a joint arrangement of one Organizer serving two counties exists for Cumberland and Westmorland, and for Brecon and Radnor. The Organizer is generally assisted by a staff of experts in subjects allied to agriculture. The total number of full-time instructors is 358, and the following list shows the number of each type employed. In addition a number of part-time instructors in the various subjects are also employed:—

Agricultural Instructors (in general agriculture, economics, chemistry, biology, mycology, etc.)				100 in 37 counties.
Horticulture	..	..	..	93 „ 55 „
Dairying	..	..	..	55 „ 35 „
Poultry-keeping	..	..	..	66 „ 46 „
Dairying and Poultry-keeping (combined)	..	..	..	14 „ 12 „
Farriery	..	..	..	3 „ 3 „
Bee-keeping	..	..	..	4 „ 4 „
Veterinary Science	..	..	..	4 „ 4 „
Farm Accounting	..	..	..	3 „ 3 „
Rural Domestic Economy (Fruit and Vegetable Preservation, etc.)				4 „ 4 „
Manual Processes (hedging, ditching, pruning, grafting, woodwork, etc.)				11 „ 7 „
Agricultural Engineering				1 „ 1 county

In addition to the organized instructions given to students and the management of county farm institutes, experimental stations, demonstration plots and egg-laying trials, the county staffs serve the industry in an advisory capacity. The following table indicates the extent of these advisory services rendered by county staffs during the year 1932-33:—

<i>Subject.</i>	<i>Visits paid</i>	<i>Correspondence</i>	<i>Visits to markets, calls at office, telephone, etc.</i>
Agriculture ..	27,057	42,779	.. 34,222
Horticulture ..	19,816	21,577	.. 11,445
Dairying	12,793	9,295	.. 5,284
Poultry-keeping	19,812	17,454	.. 13,631
Bee-keeping ..	4,638	2,382	.. 408
Other subjects ..	2,617	2,615	.. 647
	86,733	96,102	65,637

The interest taken by farmers in the new agricultural and marketing developments has caused a great deal of work. It has meant generally that county staffs have worked under heavy pressure. In a few instances it has been found possible to make small improvements in staffing arrangements at the expense of other activities; but it is becoming

EDUCATION AND RESEARCH REPORT.—II

clear that further increases in staff will be required in the near future, if an adequate advisory service is to be maintained.

A Conference of Agricultural Organizers was held at Oxford from July 11-14, 1933; such conferences are held once every two years, alternately at Oxford and Cambridge. They provide a very necessary opportunity for the Organizers to meet and discuss subjects of common interest. The theme of the 1933 Conference was "The Reorganization of Agriculture." In addition to an address by the Minister, addresses were given on the new marketing schemes by Capt. E. T. Morris and Mr. A. E. Marsh (Pigs and Bacon), Mr. F. N. Blundell and Mr. T. Baxter (Milk), and Capt. J. Mollett (Potatoes); on "The Regulation of Supplies in relation to Agricultural Organization" by Mr. A. W. Street; and on "The Standardization of Produce" by Sir William Lobjoit.

C. DAIRYING.

The work of the Department in this subject includes (1) the supervision of the facilities provided at agricultural colleges and by local authorities at farm institutes for courses of instruction in dairying, the appointment of dairy instructors for educational work in the counties, and (2) the formulation and administration of schemes that aim at improving farmers' technique and at the provision of a clean milk supply. Under this last head come the clean milk competitions, the county registers of accredited producers, and advisory schemes that are organized on similar lines. During 1932-33 the financial restrictions to which reference was made in the previous report continued to operate: if they can be relaxed shortly, considerable advances may be made at an early date. The desire for technical instruction has probably never been greater among farmers.

Courses of Instruction.—The number of students who were taking regular courses in dairying at agricultural colleges and farm institutes during 1932-33 was 1,058, i.e., 230 at agricultural colleges and 828 at farm institutes. These figures show a slight increase on the previous year's total of 1,043 students: but there was unfortunately a decrease in the numbers of students attending occasional courses in dairying, butter- and cheese-making, etc., which

EDUCATION AND RESEARCH REPORT.—II

in 1932-33 were slightly above 3,400 as compared with about 4,000 last year.

The courses at agricultural colleges may be full-time courses proceeding to a degree or diploma in dairy husbandry as at Reading, or they may form part of the general agricultural course. The arrangements at farm institutes provide for short courses of six months especially for women students, the men students generally taking dairy husbandry in their agricultural course. The instruction given at farm institutes is of a more elementary and practical type than that at agricultural colleges; it is designed to turn out men and women capable of taking the more responsible posts among farm workers. The occasional courses are generally arranged for short periods of a few weeks, for the instruction of local groups in the technique of butter- or cheese-making or of farm workers in hygienic methods of milking. In a number of instances travelling schools are organized, particularly for cheese-making and in certain districts for butter-making: during the year 233 such schools were held and were attended by 2,424 students. Approximately 43,000 persons attended decentralized lectures and demonstrations, an increased attendance of 6,000 over the previous year.

Clean Milk Production.—The Ministry has made efforts for some twelve seasons to stimulate the production of clean milk through the organization of clean milk competitions in the counties, and as experience has been gained other forms of activity directed to the same end have been developed more recently. First introduced in Essex in 1920, the clean milk competition scheme has been generally taken up by local authorities throughout the country, and in all the important dairy districts such competitions now form a regular feature of the county educational schemes. Uniformity has been secured through the Ministry's "Guide to the Conduct of Clean Milk Competitions," first issued in 1924, in which a definite plan is laid down for farm inspections and the taking of samples for bacteriological examination. The Ministry aids expenditure on these schemes at the rate of 60 per cent. In 1932-33, 28 clean milk competitions were commenced in England and Wales.

During the past twelve years approximately 5,200 dairy farmers have taken part in these competitions. Although

EDUCATION AND RESEARCH REPORT.—II

this figure represents only about 1 in 30 of the dairy farmers of the country, it must be remembered that the beneficial influence of clean milk competitions extends far beyond the competitors. A general knowledge of the methods employed and the standards to be aimed at spreads throughout the country and has an indirect, but appreciable, influence in improving the quality of milk production.

Milkers' Competitions.—These have, for many years, been organized in dairying districts, and at one time had only a competitive interest. They have now been brought into direct relation with the clean milk movement by being made the vehicles for providing instruction for agricultural workers in the technique of hygienic methods. Milkers' competitions, therefore, are not recognized by the Ministry unless they have a definite educational aspect. In 1932-33, 59 milkers' competitions were organized in 24 counties. In the twelve years since 1920 more than 10,000 employees have been entered in these competitions; there is, moreover, reason to think that they have a beneficial influence on the work of many dairy workers who have never themselves participated in a competition.

County Registers of Accredited Producers.—For dairy farmers who have been through a clean milk competition and who require some organized means to enable them to maintain their standard of production, county registers of accredited producers have been instituted. The scheme was first introduced in Wiltshire in 1929, and in 1932-33 it was in operation in 9 counties. Briefly, the scheme provides for the registration of producers who have obtained 66 $\frac{2}{3}$ per cent. of the marks available in a county clean milk competition of 6 months' duration (or in a "probationary" inquiry conducted on similar lines.) Samples of milk from all accredited producers on the register are examined each month, and each sample is expected to conform with the following standard:—

Bacterial Count not exceeding 300,000 per c.c.
Bacillus Coli absent in 100 c.c.

A producer who fails to conform with the standard in three consecutive months is suspended from the register until such time as he submits three consecutive satisfactory samples. The latest complete figures in respect of this

EDUCATION AND RESEARCH REPORT.—II

scheme are for the year ended December 31, 1932; they may be summarized as follows:—

Number of county educational authorities concerned ..	9
Total number of registered producers	183
Total number of samples examined	1,958
Total number of samples that conformed with the standard laid down in the scheme	1,431

As mentioned in previous reports, certain distributive firms have made use of the clean milk competition or the register of accredited producers in connexion with the payment of a bonus for milk of high standard. This project, however, will presumably soon be merged in the scheme for a Register of Accredited Producers, contemplated by the Milk Marketing Board.

Advisory Schemes.—An advisory service that includes the bacteriological examination of milk samples is available in eleven counties for licensed producers of designated milks and others, e.g., farmers who have qualified for a certificate in a clean milk competition and who are ineligible to participate again in a competition, in order that such producers may be able to maintain their standard of efficiency.

Courses for Dairymen.—Sixteen courses were held during the year, a lower number than might have been expected but for the financial restrictions on educational work. The experience of the last few years in this matter leads to the conclusion that where they are carefully organized these courses are appreciated, and they are certainly a valuable means of educating dairymen in the proper handling of milk in distribution. As opportunity offers it is hoped to extend courses of this nature.

Courses for Sanitary Inspectors.—Five courses were held in 1932-33—much below the previous year's record. The interest evoked by these courses is indicative of their value. It is to be hoped that it may be possible at no distant date to extend them and to include in them, as was done for the first time this year, a discussion of the important problem of securing an adequate water supply on dairy farms.

D. POULTRY AND SMALL LIVE STOCK.

The work of the Department in this subject includes a general supervision of the facilities provided by local

EDUCATION AND RESEARCH REPORT.—II

authorities for instruction in poultry subjects at farm institutes and by means of an advisory service; it is concerned also with the framing and administration of practical schemes, e.g., the county egg-laying trials, the accredited poultry-breeding stations scheme, and the cockerel-breeding schemes; and the general administration of the National Poultry Institute scheme. As regards other small live stock, attention is given mainly to the keeping of goats and rabbits.

Instructional and Advisory Services.—Courses of instruction in poultry husbandry at Agricultural Colleges may be of one or two years' duration, and lead generally to the standard required for the National Diploma in Poultry Husbandry. In farm institutes shorter courses are given, but many of them provide a year's course. To meet the needs of students who cannot comply with the regulations for the National Diploma in Poultry Husbandry (which require a year's experience on an approved poultry farm) a new qualification—the national certificate in poultry practice—was instituted in 1932 by the National Poultry Diploma Examination Board; it can be obtained by examination after a year's course, both theoretical and practical, at an approved institution.

Courses in poultry husbandry are very popular both with men and women students. The number of students taking the advanced courses at the National Institute of Poultry Husbandry in 1932-33 was 36, which, though not quite so high as in the peak year 1930-31, is satisfactory. Taking the agricultural colleges together the poultry students numbered 130, while in farm institutes 400 poultry students were enrolled during the year, making a total of 530. How great an advance has been made may be realized by comparing these figures with those of 1912-13, when a total of 68 poultry students was recorded for the country as a whole, i.e., 46 in agricultural colleges and 22 in farm institutes. It may be remarked also that while (in common with other classes of agricultural students) the numbers of poultry students fell away somewhat when the large increase that occurred immediately after the War had disappeared, they began to recover at an earlier date than other classes of agricultural students and are now at a higher point than at any previous period.

For the assistance of the practising poultry farmer, local

EDUCATION AND RESEARCH REPORT.—II

authorities have instituted an advisory service through the appointment of County Poultry Instructors who are available to give advice to all poultry keepers in their area on points of practical difficulty. During the winter months local lectures on poultry subjects are arranged in nearly all counties. In order to keep County Poultry Instructors in touch with the results of recent poultry research two refresher courses were arranged during the year, at the Ministry's Veterinary Laboratory, Weybridge. These courses were highly successful, and occasion will be taken to arrange others to accommodate Instructors who were not able to attend the previous courses.

Reference may be made here to the technical literature on poultry that has been issued by the Ministry during the year. Three new bulletins and a number of advisory leaflets were published. Sales of the Ministry's publications on small live stock during the year have been very satisfactory.

The volume of inquiries from the public on poultry subjects during the year has shown no falling off, and this may be taken as an indication of the popularity of poultry-keeping throughout the country. Indeed, in 1932, the number of poultry on agricultural holdings of more than one acre showed an increase of nearly $5\frac{1}{4}$ millions, or approximately 10 per cent. over the figure for 1931. For the commercial poultry farmer, however, the prospects of the industry in 1932-33 were somewhat less favourable than in the previous year; while the average price of eggs, and, to a lesser extent, of poultry during the year declined slightly as compared with average prices in 1931-32, the cost of poultry feeding stuffs showed a distinct tendency to rise. On the other hand, it may be remarked that the cheaper methods of housing and management that have been coming into vogue during the last two or three years, and are now being extensively tried out throughout the country, will tend to lower the costs of production; and also that the customs duties on imported eggs and poultry that were first imposed in March, 1932, and those levied on produce from the Irish Free State in July or November, 1932, may be expected to have a beneficial influence on the situation.

County Egg-laying Trials.—In 1932-33 trials were conducted by 39 counties under the Ministry's scheme, as

EDUCATION AND RESEARCH REPORT.—II

against 38 in 1931-32. The number of birds competing was 9,105 in 1932-33, as against 8,409 in the previous season. For the year under review, the regulations as to the scoring points were subject to revision with the object of giving due credit to birds that lay most heavily in the winter months. The average egg production during this season's trials was 181·87 per bird, which compares satisfactorily with the average of 181·23 in 1931-32. The leading county in this season's trials was Lindsey (Lincolnshire) and to this county goes for the second time the Competition Cup presented by the Millers' Mutual Association.

The death rate among high-grade stock has been giving rise to anxiety among poultry breeders for some years past, and the incidence of mortality at county laying trials leaves no doubt of its seriousness and growing importance. During the last six years there has been a steady rise in the percentage of mortality recorded, from 5 per cent. on 2,800 birds in 1927-28 to 10·7 per cent. in 1932-33 when over 9,100 birds were entered in the trials. Heavy as this death roll is, it is understood to be well below that recorded for the total number of egg-laying trials recognized by the National Poultry Council.

Accredited Poultry-breeding Stations.—During the season 1932-33 the Accredited Poultry-Breeding Station Scheme was operating in 17 counties, and the station holders numbered 121. This represents a substantial growth over the previous season, and the evidence is quite favourable to a further expansion. For the purpose of securing uniformity, the Ministry has issued model regulations governing the classes of stock that are to be allowed under the scheme, and the conditions as to testing birds for freedom from the disease known as B.W.D. A national register has been compiled, which it is proposed to re-issue annually, containing particulars relating to all the station holders throughout the country.

Cockerel-breeding Scheme.—This scheme aims at making available at reasonable prices cockerels bred from first-class hens that have been awarded the special merit certificate at county laying trials. It was begun in a tentative way by a single county in 1928-29 and is now in operation by seven counties. The scheme is still in an experimental stage, and the Ministry has not yet found it desirable to issue model regulations, though, for the most

EDUCATION AND RESEARCH REPORT.—II

part, the schemes in operation are practically identical. Particulars received to date relating to the 1932-33 season, are not quite so favourable as for the previous season in respect of the numbers, and sometimes of the quality, of the cockerels reared; but it is not expected that the special difficulties that were encountered during this season will recur.

National Poultry Institute Scheme.—It is unnecessary to refer in detail to the experimental and research work that is being carried out under the National Poultry Institute Scheme. The following brief notes will suffice to indicate the nature of the work in progress; for further particulars reference should be made to the annual report issued by the Ministry on the work of the Research Institutes.

(a) *National Institute of Poultry Husbandry.*—During 1932-33 an attempt was made to simplify the experimental work and to concentrate it on a few important issues. The main work consisted in the trial of rations to test the value of different constituents, and of various classes of stock under different systems of management.

(b) *Ministry's Veterinary Laboratory, Weybridge.*—The work on tuberculosis in poultry has been continued and extended. Outbreaks of disease among pheasants and ducklings have claimed attention during the year. In addition, the investigation of other diseases, including Newcastle disease, fowl paralysis, and coccidiosis, has been continued.

(c) *School of Agriculture, Cambridge.*—Work has been continued on the effect on the quality of both eggs and carcass produced by feeding fatty materials, etc.

(d) *Breeding Work on Poultry at Cambridge.*—The study of the inheritance of fecundity has been continued; a new breed, the Silver Cambar, has been fixed, as well as a new breed of dark runner ducks that give a sex-linked result with fawns. The nature of the blue egg has been investigated, and its relation to white and brown eggs studied. Progress has been made with the improvement of the Cambar from a commercial standpoint.

(e) *Northern Breeding Station, Reaseheath.*—As the experiments in in-breeding in which a father-daughter mating was used have been concluded, a new series of experiments has been drawn up, including (a) a cross-breeding experiment to study the value of the first cross against the pure breed, (b) an attempt to produce a strain of commercial poultry capable of withstanding continuous in-breeding, and (c) a study of the inheritance of fertility in White Wyandottes.

(f) *Southern Table Poultry Experiments at Wye.*—The investigation in 1932-33 was mainly concerned with the possibility of reducing feeding costs during the fattening period without impairing the quality or weight standard of the table birds produced.

Stud Goat Scheme.—The scheme, the local administration of which is in the hands of the British Goat Society, aims at encouraging the keeping of goats of improved milking quality by small breeders, etc. Services by approved stud goats are available at a charge of not more than 4s. a service, and a number of premiums are awarded to qualified goats. During 1932-33, goats were stationed at

EDUCATION AND RESEARCH REPORT.—II

97 centres approved under the scheme. The Ministry makes a grant towards administrative expenses and the cost of the premiums awarded.

Rabbits.—From the Ministry's information it appears that rabbit-keeping as a side line is still fairly popular: but that the economic depression has hit the industry badly. There is still a limited market for good quality Angora wool at fairly satisfactory prices; and the same may be said of first-class pelts.

E. MISCELLANEOUS.

(1) Scholarships for the Sons and Daughters of Agricultural Workmen and Others.—The scheme under which these scholarships are awarded was established in 1922 and owes its inception to the Corn Production Acts (Repeal) Act, 1921. Its main objects are (a) to fill a gap in the existing agricultural education system by opening to children of agricultural workers an avenue whereby they can obtain a sound technical training in agriculture, and (b) to improve the standard of agricultural production by returning annually to the industry a body of young men and women well trained and skilled in the practices of agriculture.

Benefits under the scheme are confined to (a) sons or daughters of agricultural workmen, or of working bailiffs and smallholders whose means are comparable with those of agricultural workmen; (b) sons or daughters of other rural workers whose means and method of livelihood are comparable with those of agricultural workmen; and (c) *bona fide* workers in agriculture.

Awards are of three types, namely, (1) junior scholarships tenable at farm institutes and similar institutions for courses, not exceeding one year, in agriculture, horticulture, dairying or poultry husbandry, or in a combination of two of these subjects; (2) extended junior scholarships for advanced or specialized courses of instruction, not exceeding one year, at farm institutes or agricultural colleges (these awards are reserved for those who have already held junior scholarships); and (3) senior scholarships tenable for degree or diploma courses in an agricultural subject at university departments of agriculture or agricultural colleges, or for courses in veterinary science at veterinary colleges. All awards cover the whole cost of instruction while students are at the training institutions, and in addition provide for the

EDUCATION AND RESEARCH REPORT.—II

payment of allowances on a scale sufficient to meet ordinary living expenses adequately, but economically, at the institutions concerned.

During the 12 years the scheme has been in operation (1922-33) assistance has been granted to some 1,300 individuals involving the award of 1,494 scholarships. Of these, 70 were for degree courses extending over three or four years, 94 for two-year diploma courses and 1,330 for farm institute courses. The distribution of the awards among the various classes of beneficiary is as follows:—

	Eleven years, 1922-32. 1933		Total.
Sons or daughters of agricultural workmen ..	357	40	397
" " working farm bailiffs ..	106	10	116
" " smallholders ..	338	36	374
" " other rural workers ..	215	21	236
Candidates who qualified on their own account as <i>bona fide</i> workers in agriculture ..	343	28	371
	1,359	135	1,494

The after-careers of the 1,055 students who have completed courses of instruction have been followed up; it is found that the training provided by the scheme is having satisfactory results on their subsequent careers. The latest information shows that about 10 per cent. (principally ex-senior scholars) are engaged in administrative, teaching, research or advisory posts; 73 per cent. are earning their livelihood in practical agricultural work, about 17 per cent. (or one-quarter) of them holding supervisory posts; the number known to have left the industry is less than 5 per cent. Of the remainder, 3 per cent. are temporarily out of work; and track has been lost of 9 per cent. (movements from farm to farm accounting for loss of contact), most of whom, however, are believed to be occupied in agricultural pursuits. Details are as follows:—

Administrative, teaching, research or official appointments ..	79
Veterinary surgeons	2
Agricultural posts of a supervisory nature	209
Engaged in practical agricultural occupations	549
Working on own account	30
Obtained employment outside the agricultural industry ..	43
Seeking employment at date of inquiry	32
Women who have married	19
Died	5
Cannot be traced	87
	1,055

EDUCATION AND RESEARCH REPORT.—II

(2) Young Farmers' Clubs.—Up to the beginning of May, 1932, the National Association of Young Farmers' Clubs was under the auspices of the National Council of Social Service. From May 5 the organization, under the title of the National Federation of Young Farmers' Clubs, assumed control of its own destinies, with Major Morton Hiles, O.B.E., as Secretary.

The progress made during the year was very satisfactory, a large increase in the total number of clubs being recorded. Amongst the activities of the Federation the International Cattle Judging Competition held at the Royal Show again proved to be a very successful event, while the Cattle and Poultry Judging Competitions at the Dairy Show attracted considerable attention. Details of the results of these competitions were published in the Ministry's JOURNAL.

Towards the end of the year preparations were being made to launch an appeal for funds to enable the Federation to be established on a permanent footing. It was estimated that £25,000 would be required for the purpose.

(3) Sugar - beet.—Funds were again provided by the beet-sugar factories to enable a programme of education and research in sugar-beet cultivation to be carried out during 1932-33.

Under the Regional Prize Scheme, prizes to the total amount of £600 were awarded to successful growers and were presented by the Parliamentary Secretary at the Hotel Victoria, on April 27, 1933, on the occasion of the Annual Luncheon of the British Sugar-Beet Society.

LICENSING OF STALLIONS UNDER THE HORSE BREEDING ACT, 1918

THE number of stallions licensed in England and Wales under the Horse Breeding Act, 1918, showed a further considerable increase in 1934, 1,687 licences being issued as compared with 1,516 in 1933. The following table shows the number of stallions licensed in each year since 1928:—

	Service Season.						
	1928	1929	1930	1931	1932	1933	1934
Shires	720	760	752	761	853	888	962
Other Heavy Horses ..	313	329	335	342	358	387	471
Light Horses (including ponies)	381	347	343	329	266	241	254
	<u>1,414</u>	<u>1,436</u>	<u>1,430</u>	<u>1,432</u>	<u>1,477</u>	<u>1,516</u>	<u>1,687</u>

The number of heavy stallions licensed increased from 1,275 in 1933 to 1,433 in 1934; Shires increased by 74, Suffolks by 28, Clydesdales by 25, and Percherons by 14. The number of light stallions licensed was about the same as in the previous year, but pony stallions advanced from 61 in 1933 to 73 in 1934.

Licences were refused in respect of 45 stallions, an increase of 5 as compared with 1933. Seven appeals against refusals were lodged as compared with 10 in the previous year, and 5 of them were successful. The breeds of the stallions rejected and the reasons for their rejection are given in the table on opposite page.

Twenty-six infringements of the Act were reported to the Ministry during the season as against seventeen in 1933. Successful proceedings were taken by the Police in two cases where unlicensed stallions were being travelled for service or being exhibited on premises not in the owner's occupation with the object of their use for service. Most of the other infringements reported were in respect of the travelling or exhibiting for service of licensed stallions unaccompanied by their licences, and in these instances the owners and leaders were warned by the Ministry or Police as to the requirements of the Act in this respect.

Stallion owners in possession of licences for the year ended October 31, 1934, are reminded that these licences expired on that date, and should be returned to the

LICENSING OF STALLIONS

Ministry. Application for licences for the 1935 travelling season may now be made, and it will greatly assist the Ministry to make economical arrangements for the examination of stallions if applications are made as early as possible. Application forms may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

NUMBER OF APPLICATIONS FOR LICENCES NOT GRANTED AND GROUNDS FOR REFUSAL, 1934.

Breed	Number refused	Percentage refused	Disease											
			Whistling	Roaring	Sidebone	Cataract	Stringhalt	Ringbone	Bone Spavin	Shivering	Defective Genital Organs	Poor Physique & Conformation	Inadequate Prolificacy	
PEDIGREE														
Clydesdale ...	1	0·7	1a	—	—	—	—	—	—	—	—	—	—	
Percheron ...	1	1·5	—	—	—	—	—	—	—	1	—	—	—	
Shire ...	20	2·3	4c	3	3	3c	1	1	1	1b	—	—	3	
Suffolk ...	2	1·1	—	—	1	1	—	—	—	—	—	—	—	
Hackney ...	1	8·3	—	—	—	—	1	—	—	—	—	—	—	
Thoroughbred	1	0·7	—	—	—	—	1	—	—	—	—	—	—	
Dales Pony...	1	10·0	—	—	—	—	—	—	1	—	—	—	—	
Fell Pony ...	1	10·0	—	—	—	—	—	—	—	—	1	—	—	
Polo Pony ...	1	9·1	—	—	—	—	—	1	—	—	—	—	—	
Welsh Cob	1	5·6	—	—	—	—	1	—	—	—	—	—	—	
NON-PEDIGREE														
Heavy ...	12	5·3	1	5d	3	—	—	1	1	—	—	1	—	
Light ...	1	6·7	—	1	—	—	—	—	—	—	—	—	—	
Pony and Cob	2	10·5	—	—	—	1	—	—	—	—	1	—	—	
Totals ...	45	2·6	6	9	7	5	4	3	3	2	2	1	3	

a. Also affected with roaring. b. Also affected with stringhalt. c. One also affected with roaring. d. One also affected with sidebone.

[For number of applications for licences, and number of licences granted and refused, see next page.]

LICENSING OF STALLIONS

NUMBER OF APPLICATIONS FOR LICENCES AND NUMBER OF LICENCES GRANTED AND REFUSED IN ENGLAND AND WALES, 1933-34.

Breed or Type	Pedigree (i.e. stallions entered or accepted for entry in the recognized Stud Book of their Breed).			Non-Pedigree (i.e. stallions not entered or accepted for entry in a recognized Stud Book).			Totals of each breed or type (pedigree and non-pedigree).		
	Applications	Licensed	Refused	Applications	Licensed	Refused	Applications	Licensed	Refused
HEAVY									
Clydesdale	139	138	1	28	25	3	167	163	4
Percheron	68	67	1	4	4	—	72	71	1
Shire	857	837	20	130	125	5	987	962	25
Suffolk	178	176	2	7	6	1	185	182	3
Others	—	—	—	58	55	3	58	55	3
LIGHT									
Arab	9	9	—	3	3	—	12	12	—
Cleveland Bay	4	4	—	—	—	—	4	4	—
Hackney	12	11	1	5	5	—	17	16	1
Hunter	3	3	—	1	1	—	4	4	—
Thoroughbred	141	140	1	3	3	—	144	143	1
Others	—	—	—	3	2	1	3	2	1
PONY AND COB									
Dales	10	9	1	6	6	—	16	15	1
Fell	10	9	1	1	1	—	11	10	1
Polo and Riding	11	10	1	1	1	—	12	11	1
Shetland	3	3	—	—	—	—	3	3	—
Welsh	8	8	—	2	1	1	10	9	1
Welsh Cob	18	17	1	9	8	1	27	25	2
Totals	1,471	1,441	30	261	246	15	1,732	1,687	45

MARKETING NOTES

Milk Marketing Scheme. Producer-Retailers' Licences.

—Paragraph 62 of the Milk Marketing Scheme provides that no registered producer shall sell milk by retail except under and in accordance with the terms of a retail licence issued to him by the Milk Marketing Board. The licences issued by the Board, when the Milk Marketing Scheme came into operation a year ago, contained a condition that the licensee must not retail milk at a price less than the "prevailing retail price" in the district in which the milk was sold. In this respect the terms of the licence accorded with those of the first contract for the sale of milk by wholesale, in so far as the latter governed the resale of milk by retail. The validity of the original licences extended to September 30, 1934, and in the meantime, i.e., on April 1, 1934, a new wholesale contract became operative in which the term "prevailing retail price" was replaced by a provision that bound the purchaser not to resell the milk by retail at less than the "minimum appropriate retail price" for his district, as calculated by the addition of varying "margins" to the wholesale purchase price. This condition has been retained in principle in the new wholesale contract which, however, specifies minimum retail prices (instead of margins) for various districts according to their size, type and situation.

A new form of retail licence has been prescribed by the Board and is valid for twelve months from October 1, 1934. It contains terms similar to those of the current wholesale contract with regard to retail prices; both the wholesale contract and the retail licence include a provision enabling a representative body of retailers and producer-retailers in any area to petition the Milk Marketing Board for a local reduction of those prices.

Local Reductions of "Minimum Appropriate Retail Prices."—The Milk Marketing Board announced, on October 8, that it had so far granted 90 applications for reductions in local minimum retail prices for milk. These applications came from all parts of the country, including more than 20 towns in Lancashire. In 8 cases, applications had been refused because they were not sufficiently representative of the retail interests in the districts concerned.

MARKETING NOTES

A further 100 applications are under consideration by the Board.

Prices of Milk Sold to Hospitals.—The Board has prescribed a separate form of contract (L.A.C. 35/4) for sales of milk by wholesale by producers to local authorities and voluntary hospitals (i.e., hospitals and similar institutions at least partly supported by voluntary contributions and not carried on for profit). This contract gives the same alternatives as the general wholesale contract (G.C. 35/1) in regard to the purchase of whole or level dairies. It also provides for the sale of daily quantities to be agreed each day between vendor and purchaser, in which case the purchaser is required to pay an "accommodation premium" of not less than 1½d. per gal.

Pool Prices for September.—The wholesale contract price (liquid milk buying price) for September was 1s. per gal. in all regions other than the South-Eastern region, where the price was 1s. 1d. per gal. These prices were the same as in the preceding month. The manufacturing price for milk manufactured into butter or cheese or condensed milk for export was 4d. per gal. in both months. The average price obtained for all milk going into manufacture in September was the same as in August, namely, 5 63d. per gal. Both figures include the Government advance payable in respect of manufacturing milk, under the Milk Act, 1934.

Regional pool prices and producer-retailers' contributions were as follows:—

Region	Pool Price (Pence per gallon)				Producer Retailers' Contributions (Pence per gallon)			
	Average Oct '33 to Mar. 1934	Aug. 1934	Sept. 1934	Average April- Sept. 1934	Average Oct '33 to Mar. 1934	Aug. 1934	Sept. 1934	Average April- Sept. 1934
Northern .	13.67	10½	10½	10.58	1 62	1 18	1 18	1.33
N. -Western	13.46	10½	10½	10.33	1.78	1 8	1 8	1.46
Eastern .	14.04	11	11	10.70	1.34	1	1	1.23
E. Midland	13.79	10½	10½	10.38	1.59	1 8	1 18	1.48
W. Midland	12 96	10½	10½	10.17	2.16	1 8	1 8	1.64
N. Wales ..	13.04	10½	10½	10.25	1.84	1 8	1 8	1.58
S. Wales ..	13.37	10½	11	10.54	1.84	1 18	1	1.36
Southern ..	14.04	11	11	10.70	1.34	1	1	1.23
Mid-Western	13.17	10½	10½	10 38	2 00	1 18	1 18	1.48
Far-Western	13.04	10½	10½	10.25	2.16	1 8	1 18	1.58
S.-Eastern..	14.46	11½	11½	11.25	1.41	1 18	1 8	1.33
Unweighted Average	13.55	10.77	10.82	10.53	1.73	1.24	1.20	1.43

MARKETING NOTES

Producer-retailers who did not sell milk by wholesale otherwise than on contracts carrying level-delivery premiums were credited with a level-delivery premium of $\frac{1}{4}d.$ per gal.

The inter-regional compensation levy was again fixed at $1d.$ per gal. on all liquid milk sales and the whole of the proceeds was distributed amongst the regional pools in proportion to the quantities of milk sold in each region for manufacturing purposes.

A general expenses levy of $\frac{1}{4}d.$ per gal. for expenses, liabilities and reserves was again charged on all wholesale milk sales as in August. The estimated sales of milk under contract for the month were 59,118,138 gal. The estimated sales of liquid milk were 43,418,193 gal. (73.4 per cent.) The balance, 15,699,945 gal. (26.6 per cent.), was used for manufacture, and in addition, milk manufactured into cheese on farms was estimated to amount to 2,773,752 gal. as compared with 3,004,916 gal. in August.

Pigs and Bacon Marketing Schemes: Bacon Pigs—Contract Terms for 1935.—The third contract period for bacon pigs under the Pigs and Bacon Marketing Schemes begins on January 1, 1935, and runs to the end of that year. All contracts for the sale of pigs to registered curers during 1935 must be lodged with the Pigs Marketing Board on or before November 14, 1934, otherwise the Board is entitled to refuse registration.

The terms of contracts for 1935 have now been agreed and published. The following is a brief summary of the more important features:—

Prices.—The Boards have decided to adhere to the co-operative form of contract, whereby pig prices vary with the price of British bacon and of feeding stuffs. The basis of price fixation differs somewhat from that in force at present. In the first place, the value of offals will be taken at a fixed figure of 9s. gross per pig. A change has been made in the initial bacon and pig prices from which movements up and down are calculated. Under the present contract a pig price of 11s. per score is related to a bacon price of 85s. per cwt. For the new contract period a pig price of 11s. 6d. per score will be related to a bacon price of 96s. per cwt. As before, the initial pig price will be raised or lowered 3d. per score and the initial bacon price 1s. 9d. per cwt. for every 3d. per cwt. up or down in the price of

MARKETING NOTES

the standard ration, while additions or deductions of 1d. per score will be made in the actual price to be paid for pigs for every 1s. 2d. per cwt. difference up or down between the initial price of bacon and the ascertained price. The 50:50 sharing of "profits" or "losses" is thus maintained, but only between certain bacon price levels. If and when the price of British bacon (ascertained in the manner provided) falls below 90s. 3d. or rises above 98s. 3d. per cwt., it is provided that the producer shall carry a heavier share of the profits or losses. When the bacon price is below 86s. 9d. or above 101s. 9d. per cwt., the pig producer will carry 75 per cent. of the difference above or below the initial price, the curer only 25 per cent. In between bacon prices of 90s. 2d. and 86s. 9d. downwards and between 98s. 4d. and 101s. 9d. upwards, there is a scale of pig prices which has the effect of gradually increasing the producer's share of profit or loss from 50 per cent. to 75 per cent.

Level Delivery Provisions.—Irregular seasonal deliveries have been one of the main difficulties of the scheme in the past and greatly increase the costs of producing bacon. Thus, in 1934, the number of pigs contracted for in March was only one quarter of the number in October. The new contract provides that unless a sufficient number of pigs is secured in every month throughout the year the contract will not become operative.

To encourage more regular deliveries, the curer will pay to the Board 2d. per score on all pigs delivered and the Board will distribute the proceeds as level delivery bonuses to producers who supply certain percentages of their pigs in the months January-April.

Difference in Price between Classes.—During the present contract period, Midland curers complained of insufficient supplies of the heavier pigs required for their business; the deductions for Class 2, 3 and 4 pigs, as compared with Class 1, have accordingly been reduced by 3d. per score all round, i.e., to 3d., 6d. and 1s. per score instead of 6d., 9d. and 1s. 3d. per score as in the present contract. The upper weight limit of Class 2 has, however, been slightly reduced—to 9 sc. 5 lb. instead of 9 sc. 10 lb.—and Class 3 has been correspondingly widened.

Grade Measurements.—The measurements of Grades B and D pigs have been somewhat tightened: a Class 1, Grade B pig must now conform to a maximum back fat

MARKETING NOTES

measurement of $1\frac{7}{8}$ in. and a minimum belly measurement of $1\frac{3}{8}$ in. and the maximum back fat measurement of Grade D is reduced from $2\frac{1}{2}$ in. to $2\frac{3}{8}$ in. in the months January to June, and to $2\frac{1}{4}$ in. for the remainder of the year. Grades B and D in the heavier classes are correspondingly altered.

Transport Arrangements.—As under the present contract, all pigs sold on contract for bacon curing are to be transported by the Railway Companies at a flat rate. The rate has, however, been reduced from 1s. 8d. to 1s. 6d. (net) per pig (station to station) for all pigs conveyed by rail. The producer will be under an obligation to put the pigs on rail; if he does not do so there will be a deduction of 6d. per pig from the price paid to him. The Railway Companies also undertake to provide through road conveyance in all cases within 25 miles of the curer's factory, where loads of not less than 12 pigs can be made up with an average of not less than 3 pigs per collection. The rate for this service is 2s. 1d. per pig, towards which the pig producer will contribute 6d. Both the curer and the producer have the option to provide transport without limit as to distance. The flat rate per pig, must, however, be paid to the Railway Company in each instance and a rebate claimed on a fixed scale according to the distance. The rebate will in no case be equal to the flat rate.

Insurance.—The obligation to insure all pigs sold under the contract has been abandoned. The curer, however, undertakes to pay to the producer 1d. per score towards the cost of insurance which the producer may or may not devote to that purpose, as he pleases. In the absence of compulsory insurance, the producer has to deliver sound healthy pigs and his liability extends up to the factory, notwithstanding that the curer takes delivery when the pigs are put on rail or road vehicle.

Emergency Provision.—A new clause of considerable importance has been inserted in the contract to provide against circumstances such as a serious fall in bacon prices which would make the contract price uneconomic for curer or producer. It is provided that in such circumstances either Board may at 3 months' notice declare the contracts void. In that event an appeal may be made to an independent person as to whether the contracts shall remain in force or

MARKETING NOTES

not, and, if the referee so decides, the contracts shall remain in force, notwithstanding the Board's declaration. In coming to his decision the referee must take into account prices of pigs and bacon and all other matters affecting the position.

Potato Marketing Scheme.—The Potato Marketing Board has given notice that the regulation prohibiting the sale of potatoes by wholesale by registered producers except through the agency of authorized merchants will take effect from November 1. Before that date, all registered producers will be supplied with copies of the list of authorized merchants.

At the first annual elections of district members of the Board, which were held on October 6, all those candidates for districts in England and Wales who were members of the original Board were returned unopposed. In Scotland, there were ten candidates for six vacancies; four of the original members were re-elected and two new members were returned, Mr. J. Chisholm and Mr. J. D. Hastings-Forbes.

The following were elected as special members of the Board at the general election held on October 18 in connexion with the first annual meeting of registered producers:—

Sir William G. Lobjoit, O.B.E., J.P.
Mr. J. T. Fitzpatrick.
Mr. G. E. W. Beeson.
Mr. A. Graham.
Mr. R. W. Halliday.

Hops Marketing Scheme: Appointment of Permanent Joint Committee.—Reference was made in the issue of this JOURNAL for August, 1934 (page 481), to the proposed formation of a Permanent Joint Committee on Hops, following upon the recommendations contained in the Report (Cmd. 4628) of the Provisional Hops Committee appointed by the Minister in April last. Details were also given of the agreement reached between the Hops Marketing Board and the Brewers' Society. The Permanent Joint Committee has now been appointed as follows:—

Nominated by the Minister:

Sir John R. Chancellor, G.C.M.G., G.C.V.O., D.S.O.
(Chairman).
Mr. F. D'Arcy Cooper (Vice-Chairman).
Captain O. Lyttelton, D.S.O., M.C.

MARKETING NOTES

Representing the Hops Marketing Board:

Major C. M. Higgins, O.B.E., M.C.

Mr. G. H. Edwards.

Mr. C. J. Elgar.

Mr. Stuart May.

Representing the Brewers' Society:

Colonel G. B. Winch.

Mr. F. Nicholson.

Major E. L. D. Lake.

Mr. C. G. Tosswill.

An important function of the Committee will be to supervise generally the administration of the agreement.

Milk Act, 1934: *Milk for Schools.*—The Scheme, under Section II of the Act, for increasing the demand for milk, by the supply of milk in schools or other approved centres at reduced rates (to which reference was made in the October issue of the JOURNAL—page 679) was inaugurated on October 1. The Scheme has been taken up with enthusiasm, and, while it is too early yet for detailed particulars for the country as a whole to be available, it is clear from the information received from several districts that there has already been a large increase in the numbers of children receiving milk. Hitherto, under the Scheme of the National Milk Publicity Council, about one million children have been receiving milk at 1d. per one-third pint. It is hoped that under the new Scheme, which enables children to obtain the same quantity of milk for $\frac{1}{2}$ d., the number will be raised to three million in the near future. It is estimated that the number of children eligible for the benefits of the Scheme in England and Wales is about six million.

Cheese-Milk Price.—The cheese-milk price for the purpose of Exchequer payments under Sections 1-3 of the Act, in respect of milk sold for manufacture, used by Milk Marketing Boards for manufacture, or converted into cheese on farms, has been certified by the Minister to be 3.86 pence per pound for the month of September, and 3.72d. per pound for the month of October.

Milk (Evidence) Regulations, 1934.—These Regulations, which were made on September 22, under Sections 1, 2 and 3 of the Milk Act, 1934, prescribe the evidence required to satisfy the Minister under these Sections of the Act, and the type of audit certificate required. They also provide that the Milk Marketing Board shall, if so required by the Minister, produce their books and records as further evidence, for the inspection of such persons as he may

MARKETING NOTES

appoint. Under Section 1, the evidence takes the form of a Certificate signed by the Chairman, General Manager and Chief Accountant, stating the quantity of milk used for manufacture elsewhere than at a farm and otherwise than by the Board itself, the product manufactured, the month when the milk was used, and the net cost per gal. to the purchaser. Under Section 2, a Certificate, similarly signed, will be required stating the quantity of milk used for manufacture by the Board itself, the product manufactured, and the month when the milk was used. Under Section 3, a similar Certificate will be required stating the quantity of milk used by farmhouse cheesemakers in manufacturing cheese at farms in their own occupation, and the month when the milk was used, and also certifying that at the beginning of the month in question each registered producer had in his possession not less than the number of milch cows specified in the current Order made by the Minister under the proviso to Section 3 of the Act.

Cattle Industry (Emergency Provisions) Act, 1934.—Payments under the Act during the period September 1 to October 23 amounted to £430,817 in respect of 181,532 cattle, an average of £2 7s. 6d. per animal.

National Mark Honey.—Draft Regulations* permitting, for the first time, the packing of extracted heather honey under the National Mark, have now been gazetted. The definitions of quality for "Select Heather" honey prescribe that the honey shall contain not less than 77·5 per cent. of total solids, not more than 5 per cent. of sucrose, and that the total acidity shall not exceed 0·2 per cent. expressed in terms of formic acid. The honey is required to be of the characteristic flavour of honey produced from the nectar of heather, free from any tinge of green, and, when tested in a condition free from granulation, to show a characteristic gelatinous consistency. It is also to be free from surface dirt and scum.

National Mark Beef.—The number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during July, August and September, 1933 and 1934, and the three weeks ended October 20, 1934, were as follows:—

* The Agricultural Produce (Grading and Marking) (Honey) Regulations, 1934.

MARKETING NOTES

LONDON AREA.

	<i>Home-killed.</i>	<i>Scotch Sides for London.</i>	<i>Scotch Sides marked at Smithfield.</i>	<i>Total.</i>
July, 1933 ..	6,712	.. 4,221	..	10,935
" 1934 ..	6,850	.. 5,313	..	12,163
August, 1933 ..	7,197	.. 4,533	..	11,730
" 1934 ..	7,135	.. 5,401	..	12,536
September, 1933	8,777	.. 5,114	..	13,891
" 1934	6,710	.. 5,884	..	12,594
Three weeks ended October 20, 1934 ..	5,978	.. 4,319	..	10,297

BIRKENHEAD AREA. (Including Liverpool.)

	<i>For London (included under Home-killed in London Areas).</i>	<i>Liverpool (for local requirements).</i>	<i>Total.</i>
July, 1933 ..	1,420	—	1,420
" 1934 ..	1,194	1,304	2,498
August, 1933 ..	2,132	—	2,132
" 1934 ..	1,661	1,294	2,955
September, 1933	3,312	—	3,312
" 1934	1,954	1,250	3,204
Three weeks ended October 20, 1934 ..	1,896	964	2,860

BIRMINGHAM AND YORKSHIRE AREAS.

	<i>Birmingham.</i>	<i>Leeds.</i>	<i>Bradford.</i>	<i>Halifax.</i>
July, 1933 ..	3,738	1,714	1,566	390
" 1934 ..	3,775	1,937	1,521	443
August, 1933 ..	3,985	1,975	1,349	418
" 1934 ..	4,015	1,810	1,282	362
September, 1933	4,079	2,019	1,497	435
" 1934 ..	4,059	1,864	1,432	416
Three weeks ended October 20, 1934	3,399	1,511	1,114	334

Improved Marketing of Turkeys, Christmas, 1934.—

In the autumn of 1933, an experimental scheme was introduced to improve the marketing of home-produced turkeys and geese of good quality. The scheme was well received by producers, distributors and the public, and in response to representations a revised scheme to operate in respect of the Christmas, 1934, trade has been prepared in the light of last year's experience. It is proposed that authorized packers in the National Mark Dressed Poultry Scheme should be invited to undertake, on an agreed service-charge basis,—

- (a) to collect, kill, grade, mark, pack in containers or otherwise, and consign turkeys; or
- (b) grade and mark turkeys on producers' premises at agreed rates varying in accordance with the number of birds submitted for grading.

The Scheme also contemplates the temporary authorization of producer-dealers and dealers or other producers,

~~Marketing Notes~~

with an output of not fewer than 500 turkeys, to apply the National Mark to dressed turkeys during the month of December. Other producers may either have their turkeys graded on the farm or send them alive to a grading centre for this purpose.

Producer-dealers, dealers or other producers desiring to participate, either by becoming temporarily authorized as packers in the National Mark Dressed Poultry Scheme, or by having their turkeys graded on their farms or at an authorized packing station, should apply at once to the Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, for full particulars of the scheme.

National Mark Canned Fruit and Vegetables.—The following firms have recently been authorized as National Mark canners:—

Eastern Counties Preserves Ltd., Long Sutton, Lincs.
Park Farm Preserves Ltd., Winchcombe, Glos.

The 1934 season has been somewhat similar to that experienced in 1933. Most of the soft fruits matured early and the dry conditions partially spoil the strawberry and raspberry crops. The quality of loganberries and blackcurrants was good; but the heavy crops and early ripening of plums, and the resulting smallness and softness of the fruits arriving at the canneries, led to some difficulty in securing a satisfactory pack of this fruit. The dry season also affected the canning of fresh peas, and factories were frequently forced to work at high pressure owing to the rapid rate at which the peas matured. The early packs were generally of good quality, but the later crops varied considerably.

The total fruit pack has probably been considerably less than that of last season on account of (a) lack of suitable supplies; (b) partial or complete failure of crops in certain areas; and (c) uncertainty as to market demands in view of the heavy stocks in the hands of distributors at the end of last season.

Despite the difficulties of the season, National Mark canners have made every effort to maintain and improve the high standard of quality required by the Scheme. On the advice of the Fruit and Vegetable Canners' Association of Great Britain, and the National Mark Canned Fruit and Vegetables Trade Committee, stricter standards, of which an account was given in the March issue of the JOURNAL,

MARKETING NOTES

have been introduced this season into the National Mark scheme. In view of the increasing competition of imported supplies, the importance of adhering closely to these standards has been fully recognized by canners, although this has probably meant that a higher proportion of second quality packs (not National Mark) has been produced. Over 2,000 reports have been made on the samples collected by the Ministry's inspectors at the factories. Canners have been greatly assisted in the maintenance of quality by these reports, and in numerous instances they have decided not to apply the National Mark to packs of doubtful quality. The score-card system of reporting on the examination of factory samples, adopted last season, has been still further improved this year and has proved of undoubted help in controlling the quality of the product at the factory.

Home-grown Plums: An Investigation into Marketing Methods.—During the season of 1933, and again, in 1934, the Ministry made investigations with the object of finding out to what extent fruit growers generally are endeavouring to grade their fruit and improve their packs.* The following report deals with the investigation into the marketing of plums.

For the purpose of this investigation, samples of plums representative of the day's supplies were purchased from time to time in the London wholesale markets. The varieties represented were Czar, Purple and Yellow Pershore, Louvain, Victoria and Monarch, and they were packed both in returnable and non-returnable containers. None of the samples bore the National Mark.

The samples were examined, weighed and counted with reference to National Mark standards. Even when a tolerance of 10 per cent. by count was allowed, only 10 per cent. of this year's samples was up to standard quality, compared with 50 per cent. last year. A large proportion of the 1934 samples fell below the statutory standards on account of size, but there was not much evidence of "topping."

Where the fruit consigned was sizeable and well graded for size, colour and uniformity of ripeness, it made as a rule about double the price of other fruit. It appears that an advance has taken place this season in the use of non-returnable containers, especially boxes.

* Reports on previous investigations appeared in the August, 1933, and November, 1933, issues of this JOURNAL.

MARKETING NOTES

National Mark Flour at the Bakers' and Confectioners' Exhibition, 1934.—In the British Wheat Flour Competition held at this Exhibition, the class for All-English Yeoman Wheat Flour milled to National Mark Standards attracted 20 entries from authorized miller-packers in the National Mark Scheme, this being a larger entry than for any other class in the Competition. The gold, silver and bronze medals and diplomas offered by the Ministry to the winning entrants were awarded by the judges as under:—

Gold Medal and Diploma.—Messrs. C. J. Hudson, Ltd., Isle of Thanet Flour Mills, Ramsgate.

Silver Medal and Diploma.—Mr. James Nutter, Station Mill, Fulbourn, Cambs.

Bronze Medal and Diploma.—Messrs. Cadge and Colman, Roller Flour Mills, Peterborough.

The wheat used in milling the flour that secured the first place was supplied by Mr. A. G. Brockman, Updown Farm, Margate, to whom a gold medal has also been awarded by the Ministry.

The judges were unanimously of opinion that National Mark flours milled from wheat of this season's harvest attained a high standard, which was comparable to that of the entries in the same class last year. Abnormal sunshine during the ripening period had imparted a better appearance than usual to both the wheat and the flour. The judges also considered that the loaf made from the winning flour was of outstanding merit, and was superior to any loaf produced from National Mark Yeoman wheat flour in previous tests.

Birmingham Cattle and Poultry Show : Special Market-pack Table Poultry Class.—In view of the success of the special class for market-pack table poultry, which, at the Ministry's suggestion, was introduced experimentally at the Birmingham Cattle and Poultry Show last year, the class is being repeated at this year's show, which is to be held in Bingley Hall, Birmingham, from December 1-5. The Ministry is again contributing half the prize money for this class.

Imports of Eggs.—In the October, 1934, issue of this JOURNAL (p. 677) an announcement was made with regard to the regulation of imports of eggs in shell in the period up to March 31, 1935, including the continuation up to the end of September, 1934, of the standstill arrangement that

MARKETING NOTES

was in operation during the six months March 15-September 14, 1934, in respect of imports from foreign sources and from the Irish Free State. The following statement shows the quantities of eggs in shell imported during the period March 15-September 30, 1934, compared with the figures for the corresponding period of 1933:—

IMPORTS INTO THE UNITED KINGDOM OF EGGS IN SHELL

		<i>March 15 to September 30</i>	
		1933.	1934.
		<i>Gt. hundreds.</i>	<i>Gt. hundreds.</i>
Foreign countries		7,471,266	7,571,348
Irish Free State		2,654,237	2,478,172
Other British countries ..		216,244	158,046
Total ..		<u>10,341,747</u>	<u>10,207,566</u>

Wheat Act, 1932: Sales of Home-grown Wheat.—Wheat certificates lodged with the Wheat Commission from the commencement of the cereal year, on August 1 last, up to and including October 5, 1934, covered 5,387,213 cwt. of home-grown millable wheat. The quantity sold in the corresponding period a year ago was 5,020,982 cwt.

Appointment of Flour Millers' Corporation.—The Minister of Agriculture and Fisheries and the Secretaries of State responsible for agriculture in Scotland and Northern Ireland, acting jointly, and after consultation with such bodies as, in their opinion, represent the interests of millers, have appointed the following persons to be members of the Flour Millers' Corporation, the establishment of which is provided for in the Second Schedule to the Wheat Act, 1932:—

Mr. Lewes Hector Read (Chairman),
Mr. Sidney Bruce Askew,
Mr. James McFadyen,
Mr. Alexander Hutchison,
Mr. Charles James Papworth.

The main function of the Corporation will be to buy from registered wheat growers such unsold stocks of home-grown millable wheat (up to a maximum of 12½ per cent. of the anticipated supply) remaining in the hands of registered growers, as the Ministers may by order direct.

An Order may be made before the close of any cereal year on July 31, if in the previous month the Wheat Commission represent to the Ministers concerned that it is expedient that the stocks should be purchased.

Manufacturing Notes

The present members will hold office until they are succeeded by a Corporation composed of members elected by registered flour millers under a scheme which the Preliminary Corporation is required to prepare and submit to the Ministers concerned.

Production of Home-grown Beet-sugar.—The 1934-35 campaign opened about the middle of September, and approximately 27,300 tons of sugar were manufactured during the month, as compared with 19,400 tons in the same month last year. It is expected that both the yield per acre and the sugar-content of the beet will be up to average.

Marketing Demonstrations at Shows.—During November, the Ministry is staging marketing demonstrations at the Imperial Fruit Show, Granby Halls, Leicester, November 2-10; and at the National Pig Breeders' Association, Pork Carcass Competition, Peterborough, November 13-14. At the Imperial Fruit Show, demonstrations of the grading of apples and plums will be given in addition to the usual display of National Mark produce. The display at Peterborough will be confined to a demonstration of the grade and dead-weight consignment scheme for pigs.

An Exhibition of Labels and Label Designs.—A novel feature of the forthcoming Imperial Fruit Show, calculated to appeal not only to producers of fresh and processed fruits and vegetables but also to distributors and the general public, is the exhibition of labels and label designs that the Ministry is staging in the Conference Room at the Granby Halls, Leicester, during the period of the Show—November 2 to 10.

Preliminary mention of this exhibition was made in the October issue of this JOURNAL. The display will include new designs for National Mark labels (including private brand labels incorporating the mark) for fresh, canned and bottled fruits and vegetables, jams and cider made from home-grown fruit, and for honey, as well as small tie-on labels for fruit and vegetable containers.

These new designs will be in two sections, viz., those which the Ministry has itself commissioned and also designs submitted for a competition for which the Ministry offered substantial cash prizes. The competition designs have been judged by a panel of eminent artists and business men

MARKETING NOTES

selected by the Council for Art and Industry, which was appointed early this year by the Board of Trade and has given great assistance to the Ministry in arranging the competition and exhibition. In addition to the new designs, there will be a section devoted to existing labels used in this country and overseas for the products previously mentioned.

It is hoped that producers of the commodities concerned will find the exhibition interesting and profitable. All commissioned and prize-winning designs are the property of the Ministry; the Department will be prepared to consider reasonable offers to purchase any private brand label included in these categories. Any firm desirous of purchasing an exhibited design which has not been awarded a prize, or of commissioning one to meet its particular requirements, should enter into direct negotiation with the artist concerned, whose address may be obtained from the officer in charge of the exhibition at the Granby Halls. A catalogue of the exhibits will be distributed free to visitors.

Flowers and Plants Publicity Committee.—Treasury sanction has been given to the continuance for a second year, as from November 1, of the publicity work on behalf of British-grown bulbs, roses, shrubs, trees and cut flowers, which is being conducted under the Ministry's direction with the aid of an Advisory Committee presided over by an independent chairman, Sir Lionel Earle, G.C.V.O., K.C.B.

The Committee is representative of the sections of the horticultural industry concerned, and the various organizations have promised to contribute the necessary funds to enable the work to be carried on for a further year. It is hoped that, at the expiration of this period, the industry will have established an organization that can assume full responsibility for the work.

In view of the short time that has elapsed since the Advisory Committee was appointed in February, 1934, its activities have necessarily been of a preliminary character, but a great deal of useful work has been accomplished, as will be gathered from a pamphlet which the Ministry has recently published, entitled "The Work of the Flowers and Plants Publicity Committee." Copies of this pamphlet may be obtained free from the Ministry at 10, Whitehall Place, London, S.W.1.

Manx Marketing Act.—The Agricultural Marketing Act, 1934, recently promulgated at a Tynwald of the Isle of Man,

MARKETING NOTES

follows the general lines of the Agricultural Marketing Acts of Great Britain and Northern Ireland, but differs in a number of administrative details.

It provides for the operation of marketing schemes for agricultural products, but although a separate scheme is required for each product regulated, the control of all schemes is to be centralized and placed under the jurisdiction of an Isle of Man Agricultural Marketing Society. This Society is to consist of two members nominated by the Board of Agriculture, two members elected by the farmers of each of the six shreadings, and three members nominated by the registered producers of each product regulated. In respect of each scheme, the Society will appoint an Executive Committee of five (including the three members nominated by the producers of the product regulated) to exercise the powers and duties of the Society in relation to that scheme. Besides the supervision of the administration of such schemes as come into force, the Agricultural Marketing Society is charged with the duty of preparing schemes for any products for which marketing schemes may be considered necessary. Except, however, where the Board of Agriculture consider the formation of a scheme necessary to safeguard trade between the Island and Great Britain, the Act does nothing to compel the Society to initiate marketing schemes.

When a scheme has been prepared by the Society, it is submitted to the Board of Agriculture, which is required to direct a public inquiry to be held into any objections that may have been lodged, and which may thereafter make modifications of the scheme, before submitting it to the Tynwald Court for approval. There is no provision for a poll of registered producers to be taken after Tynwald has approved the scheme. The marketing and other general powers that may be included in schemes do not differ essentially from those that may be taken by a Marketing Board under legislation in this country.

The Act also gives the Governor power to regulate or to prohibit the importation into or the exportation from the Island, of agricultural products, and to institute a system of import and export licences for this purpose. The Governor is, however, required to consult an Advisory Committee, constituted by the Act, before taking such action, which must subsequently be confirmed by the Tynwald.

NOVEMBER ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington,

NOVEMBER weather does not inspire enthusiasm in the normal course of events. Weather contrasts are considerable this month, but the outstanding features are a tendency to heavy rainfall, much fog and mist, and stormy periods. There is, too, the first real experience of winter, for ground frosts are fairly frequent and the sudden drop in the hours of bright sunshine makes one realize that November is the beginning of the "dead" season. This does not mean that all plant life is quiescent, but the prevailing tendency is for nature to take its rest. Grass growth is not altogether unknown in November, but one cannot depend upon it. There is the slow progress also of early-sown winter oats and wheat, but the severity of frost experienced has a controlling influence on this.

It is a secret of successful farming to know few idle periods among the regular workers. Certain developments in modern farming have tended to extend the seasons of employment. In the old days November was mainly associated with the preparation of ground for next year's crops—it was a month of muck-carting and ploughing. In these days it is associated also with the continued harvesting of crops, and of sugar-beet in particular. There are some who dislike this interference of sugar-beet with traditional routine, but this year the earlier concentration on beet-lifting is very pronounced. This is one of the results of the earlier harvest and last year's experience that delayed lifting after a dry summer depressed the yield of sugar.

Wheat sowing continues practically throughout November, especially on soils that have been cropped with potatoes, mangolds and beet. For late sowings, more liberal seedings are desirable, while of the varieties that are popular for this period, few have a better reputation than Little Joss, which is a most useful variety even for sowing as late as February.

The routine jobs concern the spreading of farmyard manure, the trimming of hedges and the cleaning out of ditches. Manure spreading is an essential, whereas hedges and ditches are often left to the mercy of con-

NOVEMBER ON THE FARM

venience. There is a slight difference in the practice adopted for the spreading of manure, according to the district. In some areas dung is spread direct from the cart; in others it is placed in heaps on the ground and spread later. The advantages of heaping are that much more manure can be carted out in a given time, and that the rate of application can be more accurately gauged.

Live Stock.—The main interests on the average mixed farm at this time of year concern live stock. Over the greater part of the country there will be a pronounced temptation to utilize fully such natural food as is available. This must not be construed as an excuse for neglecting live stock by subjecting them to uncongenial conditions. Young stock in particular need a watchful eye. The short days and the tendency to cold, damp nights are not the best of environments unless there is the countering influence of adequate food. The out-wintering of stock, now so popular, must not be carried to extremes; it is better to give favoured treatment to the very young and backward animals at the beginning of the winter rather than to run the risk of trouble later. On the lower-lying fields that are subject to mists the danger of husk is usually considerable, especially in animals under eight or nine months old. The conditions most favourable to good results with out-wintered cattle are that the pastures are well-drained, that they carry a certain amount of rough growth, and are provided with adequate shelter or protection from keen winds. It is sometimes suggested that shelter sheds are desirable, but it is often found that out-wintered stock make very little use of these, especially if plenty of natural protection exists. A desirable type of animal raised under these conditions quickly grows a coat of hair equal to resisting the exposure to which it is subjected. There is a general impression that out-wintered young cattle are healthier than those confined to yards. Yard wintering, however, has the advantage that it adds to the stock of farmyard manure available for arable land. This is not an important point, however, on farms that are mainly in grass and where straw is scarce.

By November dairy cows have usually become accustomed to the course of management to which they are to be subjected for the rest of the winter. There is much evidence that dairy cows can be out-wintered with success. Attempts are sometimes made to prove that herds are

NOVEMBER ON THE FARM

healthier for this type of management, but it is probable that where successful comparisons have been made, the housing conditions have not been of the most satisfactory kind. It is of the utmost importance not to coddle cows when they are brought inside, for this only tends to make them more susceptible to chills, etc., when turned outside for daily exercise. Fresh air is much cheaper than veterinary and medicine bills, and it is usually a simple matter to secure adequate ventilation without the dangers of draughts—to which exception is very rightly taken. Local conditions must always prove the deciding factor as to whether the herd is better wintered inside or outside. It is not satisfactory to out-winter dairy cows if there is no natural shelter, if the pastures are bare and if they tread badly in wet weather. The question of exercise depends on local circumstances. Many dairy farmers appear to be well satisfied with the minimum allowance of exercise. It is commonly assumed that exercise is necessary for the health of cows, but there is no unanimity on this point. The writer's winter practice is to give exercise on a grass field as long as kale is available, and thereafter to turn the cows out in a yard while the sheds are being cleaned out. This avoids the objectionable tendency of cows to stand near the gateways and tread up the grass.

Amongst the more debatable topics concerning dairy farming practice is the general usefulness of the bail method of milking under the open-air dairying system. Dixey, of the Agricultural Economics Research Institute, in a Note on the Milk Yields of a Bail Herd (*The Farm Economist*, October, 1933) finds little evidence to support or refute the contention that cows kept on open-air milking bails tend to drop in yield more quickly than those that are milked indoors by hand. Using figures obtained from a Midland farm where it was possible to compare indoor hand-milking with outdoor machine-milking, it would appear that little difference is observable with spring calvers, but that with autumn calvers the decline in production tends to be greater with cows kept in a bail herd. The question of machine-*versus* hand-milking introduces a further complication that makes it difficult to assess the real influence of the open-air system on production in such circumstances.

The ewe flock appears to have become popular again, as a result of the improved trade in lambs during the past year. Sheep are not capable of uncontrolled expansion,

NOVEMBER ON THE FARM

for no class of stock more quickly reveals the ill-effects of over-stocking. There is some indication that the health of ewe flocks has improved as a result of the dry summer, but it may still be considered an insurance to dose against fluke. Dipping, too, must not be neglected.

Black Leg.—Black Leg or black quarter is a disease that is fairly widespread, yet there had been no cases on the Midland College farm in recent years until December of last year, when three good out-wintered heifers were attacked. The period of attack is usually early spring, but that it occurs at other periods of the year makes it necessary to be careful with young cattle grazing on fields where deaths have occurred previously. The disease is a curious one in that it appears to select the thriftiest animals, while it is almost equally discriminating in respect of the age of animals. Thus the usual cases occur amongst animals that are between six and eighteen months old. Cattle over two years old or that are in-calf are rarely attacked. The characteristic symptoms of the disease are stiffness of the limbs, with swellings under the skin, especially in the region of the buttocks and shoulders. The disease may make rapid progress and defies treatment. There is, however, widespread use of vaccines, which are claimed to confer immunity for a period of six months.

Essential Equipment in Modern Farming.—Amongst the interesting developments in modern farming is the increasing reliance that is being placed in new equipment. This is one of the first signs that marketing and other schemes are making it possible for farmers to acquire equipment that adds to farming efficiency. A point that deserves careful attention is that the expenditure incurred should be justified by the results. In the sphere of pig farming, there is much room for development, but if the thing is to be done properly it implies the combination of proper housing with proper feeding. Danish-type pig houses are being increasingly utilized in this country, and have already demonstrated their usefulness under English conditions. The cost of feeding is an important item in relation to successful pig-breeding, and where a large herd of stock is carried the mixing of meals is not only a lengthy business, but requires great care if it is to be done thoroughly. Mixing machinery is now available and its purchase is quickly justified as an

NOVEMBER ON THE FARM

economic necessity wherever the home-blending of meals takes place. In the marketing of bacon pigs weights can never be satisfactorily gauged by the eye, and since it is a frequent experience for pigs that are under weight to be penalized on the question of price, it becomes essential to make use of a weighing machine to determine the actual weight of pigs. Regular weighing does secure for the whole of the pig enterprise a greater knowledge of the response to different rations and of the relative behaviour of different strains in respect of live-weight increases.

In the dairy farming section, the main concentration at the moment is in the direction of improving the cleanliness of the milk supply. Although the clean-milk movement has suffered a serious set-back in many counties by reason of the stipulation by some education authorities that milk for schools must be pasteurized, there is nevertheless every need to safeguard the purity of the supply. To this end, there is a notable increase in the use of sterilizing equipment and of refrigerators of the ethyl-chloride type.

On the farm pneumatic tyres are becoming a common feature of new equipment, and this applies to farm carts, barrows and other wheeled implements. With regard to the wood that is employed for farm implements, one feels that much greater use could be made of wood-preserving materials. This applies particularly to carts, in which there is often fairly rapid deterioration after the protective coats of paint have disappeared.

NOTES ON MANURING

F. RAYNS, M.A., and E. T. SYKES, M.A.,
Norfolk Agricultural Station.

"Condition" on Power Farms.—Green manuring was formerly regarded only as a supplement to farmyard manure in the supply of organic matter to the soil, but it is now expected to replace it on the power (or mechanized) farms where no live stock are kept. On those farms, a bare fallow cleans the land; a crop for green manuring is then sown in late summer and ploughed in for wheat, the inorganic deficiencies of the manuring being supplied by artificial fertilizers. It is all delightfully simple, and avoids all that is awkward and objectionable in handling live stock and farmyard manure—the sheet anchor of manuring for so many generations. In consequence, there is much speculation as to the length of time such a system can keep arable land in good heart, especially on the light lands usually associated with the power farms. Although several of the farms have been going for some years, the scientific literature on the subject of green manuring is still rather scanty. The oldest series of green manuring experiments on light land at Woburn have recently been summarized by Crowther and Mann in the *Journal of the Royal Agricultural Society of England* for 1933. Before giving their main conclusions, it will be as well to remind the reader of the old order of manuring in the system of farming which, according to Arthur Young, turned a district where two rabbits fought for one blade of grass, into one of the most productive arable areas in the country.

Not far from the district to which Young's words were applied, are a number of well-organized mechanized farms that keep no live stock. Green manuring and artificials are there faced with the task of maintaining condition, or inevitably the blade of grass will again excite the two rabbits in an unenviable contest. Once in three years, the power farmer uses the bare fallow and mustard crop, and usually manures with artificials every year. This procedure replaces the manuring of the old four-course rotation, in which the straw was returned at bi-annual intervals as farmyard manure; part, if not all of the roots were eaten on the

NOTES ON MANURING

land by sheep; and, once in four years, the hay aftermath was either sheeped or allowed to grow on as a green manuring for wheat, the next crop in the rotation. All the time, the stock were eating high protein-containing cakes and adding nitrogen to the land; artificial supplies of phosphates and potash were given about once in the rotation. It seems impossible, superficially, that green manuring and artificials should be able to equal the effects of such constant stocking.

As, however, there is no evidence to show that organic sources of nitrogen, phosphate and potash are essentially better than inorganic sources, the relative value of dung and green manuring depends primarily upon their permanent and not their temporary effects—or, in other words, upon their comparative capacity to add considerably to the humus in the soil. Clearly, the immediate chemical effects of green manures can be imitated by inorganic fertilizers, but the permanent benefits must depend upon physical rather than chemical action. There is no clear guide in that respect, but we know that the chemical effects of green manuring can be very delusory: Crowther and Mann show that wheat grown on the light Woburn soils after a green manuring of either tares or mustard may, and often does, suffer acutely from nitrogen starvation in the spring. This does not mean that nitrates were not produced—they were, but they were leached out by the autumn and winter rains before the wheat had developed sufficiently to utilize them. The recognition of this relationship between the time of ploughing in the crop, the winter rains and the stage of development of the crop, no doubt explains many of the very disappointing results that, in the past, followed green manuring for autumn-sown crops.

Tares, despite their power of fixing atmospheric nitrogen, were no better than mustard; in fact, tares allowed much more rapid loss of fertility than did mustard, for they yielded up their nitrogen much more quickly. Mustard, in the early stages of decomposition, may even take in nitrogen from the soil. The Woburn results, therefore, do not encourage the practice of green manuring after a bare fallow for wheat on light land, and, as the writers say: "The two-course rotation of summer green crops and winter wheat is an unsatisfactory one on light soils. The wheat fails to benefit from the nitrogen fixed by tares. So long as the soil remains in a moderate state of fertility,

NOTES ON MANURING

mustard is more successful than tares in maintaining the fertility."

The practical lessons for light-land farmers, generally, seem to be: delay the ploughing-in of green manure as long as possible, despite the added difficulty of obtaining adequate consolidation for wheat: use mustard rather than tares or other legumes in preparation for wheat. It seems also safe to infer that green manuring would be better on light land if ploughed-down in late winter, or, if sheeped, for a quick-growing spring crop rather than for a slow-growing autumn one. This is, of course, no unusual practice in the normal treatment of rape, the kales and other crops in the root shift, as well as for Italian rye grass sown for early spring feed.

Perhaps the gloomy side of the story is told by the Woburn results, for, generally, on heavier and more retentive soils such great losses would not be anticipated, and green manuring for wheat would show up in a more favourable light. On the other hand, the physical effects of farmyard manure on heavy land are widely appreciated, and it would be expected that difficulties in working the land, and, in particular, in maintaining good tilths, would arise consequent to a reduction in the supply of farmyard manure. These problems, however, have not yet been answered: in the meantime, the mechanized farming proceeds with a very fair measure of success; and, so far, the yields on no-live-stock farms compare quite favourably with those on more normal neighbouring ones.

This is shown by the records of continuous cropping without farmyard manure from Stevens field at the Lord Wandsworth Agricultural College. The land is described by Orwin in his book, *The Future of Farming*, as a strong loam on about five feet of drift clay, overlying the chalk. Between 1913 and 1929, Stevens field grew nine corn crops and four leguminous crops, and was bare-fallowed twice. At no time was farmyard manure used. Corn yields over the period averaged about 18 cwt. per acre; and, in 1929, the yield of wheat was 11 sacks, or just over 24 cwt. per acre. The latter is considerably above and the former equal to the average for the country.

In this instance, however, the clover and seeds hay crop were used to supply organic matter to the soil, and were always followed by wheat. Again, this is the normal practice in the Norfolk four-course rotation, and it appears

NOTES ON MANURING

to have been as successful in the policy of cropping without roots, and manuring without stock, on Stevens field as it is in the usual course of arable practice. The results from Stevens field and Broadbalk at Rothamsted suggest that it is easier to maintain condition without live stock on heavy than on light soils.

Beet Tops as a Green Manure.—The actual manurial constituents of beet tops were worked out by Woodman and Bee and given in the *Journal of Agricultural Science* for October, 1927. The authors found that there was a considerable difference in the manurial constituents of the tops grown on the fens and those grown on other soils, largely because of the heavy yields of tops obtained in the fens. The actual analyses of the fresh tops were as follows:—

			Average values (not Fen tops). (Per cent. dry matter 17.2).	Fen-grown tops. (Per cent. dry matter 12.9).
Nitrogen	..	..	0.34	0.31
P ₂ O ₅	..	..	0.11	0.06
K ₂ O	..	..	0.58	0.43

Johnson and Fail, in the *Journal of the Royal Agricultural Society of England* for 1929, calculating from a yield of seven tons per acre of wilted tops, gave the manurial constituents in an acre of beet tops, as follows:—

Nitrogen	..	..	53 lb.
P ₂ O ₅	..	..	17 „
K ₂ O	..	..	91 „

When the beet tops are ploughed-in, the whole of the nitrogen, potash and phosphate presumably become available as manure. Experiments on the manurial value of beet tops have been carried out at the Norfolk Agricultural Station, and some of the results given in the Report of the Research Committee of the Royal Agricultural Society of England, in the Society's *Journal* for 1931, show that the effect of ploughing-in beet tops is to increase the yield of the succeeding barley on the average by just over 6 bushels per acre. The experiments were repeated for three years and the increase in yield in each year was 8 bushels, 4 bushels and 7 bushels per acre respectively.

Further experiments, since carried out, show that an increase in yield of 7-9 bushels per acre of barley is obtained by ploughing-in the tops, or folding them with sheep for the barley crop. A similar increase in yield of barley, however, can be obtained by carting all the tops off and applying a

Notes on Manuring

complete dressing of artificials, costing, at present prices, about £1 per acre. It would appear, then, that the full manurial constituents of the sugar-beet tops are not recovered by the barley crop, for according to the figures quoted above, the manurial constituents of the sugar-beet tops are equivalent, approximately, to $2\frac{1}{2}$ cwt. sulphate of ammonia, $\frac{1}{2}$ cwt. 35 per cent. superphosphate and nearly 2 cwt. per acre of muriate of potash. It would seem, therefore, that the beet tops must also be regarded as a source of increasing the humus content of the soil, and, indeed, there is evidence that the yield of the hay crop, the second crop after the beet tops were ploughed down or sheep folded for the barley, is increased by about 5 cwt. per acre, or approximately 15 per cent.

With the extension of the beet-lifting season from early October to January, beet tops may be ploughed in as early as five months, or as late as six weeks, before the barley crop is drilled. Early ploughing-in assists early decomposition, and thus a source of plant food for the young barley plants is made available. If there is any analogy between the Woburn results quoted above and the probable behaviour of a spring barley crop to a beet-top manuring, it is likely that ploughing-in at the end of September would result in some leaching before the barley was sown. On the other hand, experimental evidence from the Sprowston trials suggests that beet tops ploughed down in November produce heavier crops of barley than beet tops ploughed-in in January; and this, omitting the tops from beet-lifting in September and, perhaps, early October, indicates that early ploughing is necessary for the decomposition products to be available for barley drilled in March.

If a level piece of barley is to be obtained, the tops must be spread about the field before ploughing. It is not at all an uncommon sight to see unevenness in a field of barley, showing where the rows of tops have lain, or have been spread too late. It is far easier to spread the tops before the leaves have rotted; otherwise the crowns only are spread, while the leaves, which probably have a higher manurial value are left in rows and are the cause of a patchy following crop.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended October 17				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	7 12d	7 12d	7 12d	7 12d	9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20.6%) ..	6 17d	6 17d	6 17d	6 17d	6 8
Calcium cyanamide (N. 20.6%) ..	6 17s	6 17s	6 17s	6 17s	6 8
Kainit (Pot. 14%) ..	3 0	2 14	2 12	2 14g	3 10
Potash salts (Pot. 30%) ..	4 11	4 7	4 4	4 2g	2 9
" (Pot. 20%) ..	3 12	3 6	3 3	3 6g	3 4
Muriate of potash (Pot. 50%) ..	7 4	6 17	6 12	6 9g	2 7
Sulphate, " (Pot. 48%) ..	8 3	7 18	7 12	7 11g	3 2
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26.27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16k	3 6
" (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	..	6 17	6 15f	6 7	..
Steamed bone-flour (N. 1½%, P.A. 27½-29½%) ..	5 12	5 12	5 10f	5 10	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. B. MERCER. M.C., B.Sc. (Principal), and Colleagues,
Cheshire School of Agriculture, Reaseheath, Nantwich.

It is well to turn occasionally from the multitude of troubles that beset one's own path, and to take a look over the fence. As a rule, other people's troubles are very much like our own; sometimes they are identical, sometimes the same in different guise; now and again, they are more like the mirror image. Apparently, much the same can be said of national difficulties.

American Agriculture.—Anyone oppressed by the thought of England's woes would be well advised to read the latest report of the United States Secretary of Agriculture. Coldly, fearlessly scientific in form, masterly in its stark brevity, it conveys a harrowing picture of a great industry at grips with the monster Surplus—now wallowing in seas of wheat, now smothered beneath mountains of cotton, now staggering amidst hosts of hogs unmanageable as the Gadarene's.

The symptoms resemble our own; clearly also many of the difficulties encountered in national planning in this country have their counterpart in America. Interference in the complicated mechanism of private trading introduces ever-widening circles of difficulties.

There is, however, this fundamental difference between America's agricultural problem and our own. Our planning is based on the belief that increased agricultural production is desirable; America's on the certain fact that reduced production is imperative. Agricultural surpluses in Europe have been met by the imposition of tariff and other barriers; the easterly-rolling tide recoils, and American markets are hopelessly submerged. For this there is but one remedy. A strange atmosphere, therefore, surrounds the later pages of the report; the tale, so seemingly familiar, becomes suddenly unreal; one is transported in a moment from the dismal world of economics to the realms first discovered for us by Alice through the looking glass.

The main motif of agricultural education in this country has been, and still is, increased output. Critics there have always been, ready to tell us that increased output did not

NOTES ON FEEDING

necessarily connote increased profits to the producer. Further than that, the most carping critic could not go; for no one has been prepared to argue the positive proposition—that reduced production was necessarily better economy. Into some such position, however, is American science forced at present. There is, as of old, the desirability of increasing output per unit of effort; but somehow this must be accomplished within a lessened framework of national output. Thus it comes that the farm agents in 2,300 counties, together with federal and state specialists and administrative staffs, have thrown their whole energies into reducing the output of cotton, hogs and other agricultural products; thus, also, we find the Secretary reporting that “experiments to determine the relative production of dairy cows on a ration consisting of roughages alone, as compared with a full grain ration, continue to show that cows, when receiving a good quality hay, are capable of fairly high levels of production at economical costs, without the addition of other feeds to the ration.

“These results, together with data showing the comparative cost of producing nutrients in the form of grains and hays, indicate that the farmer who grows all the feed for his live stock will make more money if he grows and feeds all of the ration in the form of roughage, even with the lower production from his cows. This appears to be a practical method of slowing up the production of dairy products and at the same time increasing the profits of the producer.”

Pig Contracts.—Little statistical information bearing on grading has been published since the Marketing Scheme started; and many of the assumptions we were obliged to make at the outset still stand in need of checking.

The quantity of food needed to convert a weaner into a bacon pig is, perforce, the central fact in discussions on feeding economics. It is not an easy figure to determine. Evidence from experiments cannot be taken at its face value and applied in costings calculations; for experiments are usually conducted with small groups of selected animals, fed in small pens; as a rule, experiments take no account of accidental losses, since to do so would generally obscure the point at issue. In costs calculations, losses are of primary importance; the food fed to the pigs that fall by the wayside must be added on to the total eaten by their brethren that endure to the end. Experiments tell of the

Notes on Farming

food fed to and presumably eaten by each pig; they take no account of the food which the fowls of the air and the rats devour; nor do they tell us of the food which the pig-man unfortunately upset. There is, also, a little matter of 3 lb. per cwt. of hempen homespun that figures in the accounts as "net weight bags included." That, also, is chargeable to the pigs.

The only method of arriving at the actual food paid for per pig sold seems to be to weigh every pig on the farm at the beginning of the year, every pig sold and every pig on hand at the end of the year; from these figures, the amount of saleable pig produced can be arrived at. Similarly, the total amount of food consumed by the pigs can be determined. Simple enough on paper, each of these computations involves difficulties in practice. On most farms, some of the food, e.g., whey and kitchen refuse, has to be estimated approximately.

At Reaseheath, two attempts at calculations of this kind have been made, the first covering two complete years, 1931-33, the second, a period of eighteen months from March, 1933, onwards. The figures are as follows:—

FOOD CONSUMED (IN LB.) PER LB. LIVE WEIGHT SOLD.

		1931-3		1933-4.
All pigs, i.e., breeding animals and feeders	..	4.8	..	4.3
Feeders only	.. .. .	4.5	..	4.0

The figures relate, it should be said, to the total progeny of a herd of about 20 sows, practically all of the piglings having been fed to pork or bacon weights—a total output, that is, of about 20 tons of pig (live weight) per annum.

The Food Consumption-Increase Ratio.—It is a little disappointing to find a variation of 10 per cent. in the figures for the two periods. Part of this variation is undoubtedly traceable to the fact that, in the first period, a good many pigs were fed to weights favoured in the Midland trade, whereas, in the later period, most of the animals have been sold at or below Class 1 weights. On the other hand, the average of the two results for feeding animals, at 4.25 lb. per lb. live-weight gain is remarkably close to the Pig Commission's estimate of 4.2 lb. It should be added that the health of the herd has, throughout the 3½ years, been above expectation.

Recent price changes appear, at first glance, to have tended to encourage the production of heavier pigs, for in pre-contract days it was a well-recognized fact that, owing

NOTES ON FEEDING

to the relatively high cost of stores or weaners, the lower the selling price of fat pigs fell, the further had the feeder to carry his pigs to secure a profit; and, in general, the heavier the pigs were when sold, the greater was the profit. The fall in prices during the present contract period, the lowering of net returns by the heavy deductions, and the lessening of the price margin between Class 1 and Class 3 pigs, have all tended to reduce the profit-margin between light- and heavy-weight animals respectively. The odds, however, are still in favour of the lighter animal—that is; as long as one is dealing with standard pigs. At present (October) a Class 1 standard pig gives a net return of 11s. 5d. per score, and a Class 3 pig, 10s. 10d. per score, dead weight. The increase in value between 8 and 10 scores is therefore 15s. 4d.—but it is very doubtful whether, on the average, two scores of increase can be made from 15s. 4d. worth of food. In our view, at all events, Class 1 standard pigs are still, as at the outset of the Marketing Scheme, more likely to prove profitable to the feeder than Class 3 standard pigs, though the balance in their favour is unquestionably smaller than when the Marketing Scheme started. The new Contract goes some way towards meeting the Midland producers' grievances, since it reduces the price margin between Class 1 and Class 3 pigs to 6d. per score.

The 2,000-galloner.—The case for feeding on hay, corn and water has been put clearly and forcefully by Mr. Boutflour. No reasonable person can dispute the logic of the argument nor the presumptive proof furnished by results. But Hedges Moss Rose knew not the law, or else she had too delicate a stomach to observe it. Mangolds and oats apparently composed her staple diet.

Also Illington Dairymaid, that Shorthorn aristocrat, whose name led all the rest, had catholic tastes. The senior writer called to see her just as she had completed her 2,000 gallons in the year. She was lunching on cabbages. "What do you feed her on, mainly?" he asked. "Feed her on?" was the reply, "Oh! any d——n thing she'll eat."

Really, life is very perplexing!

NOTES ON FEEDING

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	7 9
Maize	78	7.6	6 2
Decorticated ground-nut cake	73	41.3	7 5
„ cotton cake	68	34.7	7 0

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.91 shillings, and per unit protein equivalent, 0.47 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

In accordance with the recommendation of this Committee the "food values" given in the following table may be taken as applicable to the ensuing four months, December to March, inclusive, for the purposes of advisory schemes on the rationing of dairy cows.

FARM VALUES.

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Roots—			
Kohl Rabi .. .	8	0.5	0 16
Mangolds	7	0.4	0 14
Potatoes	18	0.8	1 15
Swedes	7	0.7	0 14
Turnips .. .	4	0.4	0 8
Green Foods—			
Cabbage, drumhead	7	0.9	0 14
„ open-leaved ...	9	1.5	0 18
Kale, marrow stem ..	9	1.3	0 18
Silage, vetch and oats ..	13	1.6	1 6
Hay—			
Clover hay .. .	38	7.0	3 16
Lucerne hay	29	7.9	2 19
Meadow hay, poor ...	22	2.9	2 3
„ „ good... ..	37	4.6	3 13
„ „ very good ...	48	7.8	4 15
Seeds hay	29	4.9	2 18
Straws—			
Barley straw	23	0.7	2 4
Bean straw	23	1.7	2 5
Oat straw	20	0.9	1 19
Wheat straw	13	0.1	1 5
Grains and seeds—			
Barley	71	6.2	6 19
Beans	66	19.7	6 15
Oats... ..	60	7.6	5 18
Peas... ..	69	18.1	7 0
Wheat	72	9.6	7 2

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

Description	Price per ton	Food value per ton	Food value per ton	Starch equiv. per 100 lb.	per malt starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British	£ 5 3	£ 0 7	£ 4 16	72	s. d. 1 4	d. 0-71	% 9-6
Barley, British feeding	7 5	0 7	6 18	71	1 11	1-03	8-2
" Canadian, No. 3 Western ..	7 18	0 7	7 11	71	2 2	1-16	6-2
" Persian	7 0½	0 7	6 13	71	1 10	0-98	6-2
Oats, English white	7 3	0 8	6 15	60	2 3	1-21	7-6
" black and grey	7 3	0 8	6 15	60	2 3	1-21	7-6
" Scotch White	8 3	0 8	7 15	60	2 7	1-38	7-6
" Canadian No. 2 Western ..	8 3	0 8	7 15	60	2 7	1-38	7-6
" No. 3	8 2*	0 8	7 14	60	2 7	1-38	7-6
" mixed feed	6 8	0 8	6 0	60	2 0	1-07	7-6
" Argentine	7 17	0 8	7 9	60	2 6	1-34	7-6
" Chilean	7 17	0 8	7 9	60	2 6	1-34	7-6
Maize, Argentine	5 15	0 6	5 9	78	1 5	0-76	7-6
" Danubian Gal. Fox	5 18†	0 6	5 12	78	1 5	0-76	7-6
" Russian	6 13†	0 6	6 7	78	1 8	0-89	7-6
Beans, English, winter	5 15½	0 15	5 0	66	1 6	0-80	19-7
Peas, English, blue	10 17½	0 13	10 4	69	2 11	1-56	18-1
" Indian	8 15†	0 13	8 2	69	2 4	1-25	18-1
" Japanese	20 2†	0 13	19 9	69	5 8	3-04	18-1
Darl	8 0†	0 7	7 13	74	2 1	1-12	7-2
Milling offals—Bran, British ..	6 12	0 14	5 18	43	2 9	1-47	9-9
" broad	7 2	0 14	6 8	43	3 0	1-61	10
Middlings, fine, imported ..	7 2	0 11	6 11	69	1 11	1-03	12-1
Weatings†	7 2	0 12	6 10	56	2 4	1-25	10-7
" Superfine†	7 15	0 11	7 4	69	2 1	1-12	12-1
Pollards, imported	7 0	0 12	6 8	50	2 7	1-38	11
Meal, barley	9 5	0 7	8 18	71	2 6	1-34	6-2
" grade II	8 10	0 7	8 3	71	2 4	1-25	6-2
" maize	6 15	0 6	6 9	78	1 8	0-89	7-6
" germ	6 15	0 9	6 6	79	1 7	0-85	8-5
" locust bean	7 2	0 5	6 17	71	1 11	1-03	3-6
" bean	8 5	0 15	7 10	66	2 3	1-21	19-7
" fish	16 0	1 18	14 2	59	4 9	2-54	53
Maize, cooked, flaked	7 2	0 6	6 16	84	1 7	0-85	9-2
" gluten feed	6 5	0 12	5 13	76	1 6	0-80	19-2
Linseed cake, English, 12% oil ..	10 5	0 18	9 7	74	2 6	1-34	24-6
" " " 9% "	9 17	0 18	8 19	74	2 5	1-29	24-6
" " " 8% "	9 12	0 18	8 14	74	2 4	1-25	24-6
" " " 6% "	9 17½	0 18	8 19	74	2 5	1-29	24-6
Soya-bean cake, 5½% oil	8 5½	1 5	7 0	69	2 0	1-07	36-9
Cottonseed cake—English, Egyp- tian seed, 4½% oil	5 5	0 16	4 9	42	2 1	1-12	17-3
" " Egyptian, 4½% "	5 0	0 16	4 4	42	2 0	1-07	17-3
" " decorticated, 7% " ..	7 0†	1 5	5 15	68	1 8	0-89	34-7
" meal, decorticated, 7% " ..	7 2†	1 5	5 17	68	1 9	0-94	34-7
Coconut cake, 6% oil	6 17	0 15	6 2	77	1 7	0-85	16-4
Ground-nut cake, 6-7% oil	6 17*	0 16	6 1	57	2 1	1-12	27-3
" " decor., 6-7% oil	7 15	1 5	6 10	73	1 9	0-94	41-3
" " imported, ...							
" decorticated, 6-7% oil ..	6 15	1 5	5 10	73	1 6	0-80	41-3
Palm-kernel cake, 4½-5½% oil ..	6 5†	0 11	5 14	73	1 7	0-85	16-9
" " meal, 4½% oil	6 5†	0 11	5 14	73	1 7	0-85	16-9
" " meal, 1-2% oil	6 5	0 11	5 14	71	1 7	0-85	16-5
Feeding treacle	5 0	0 7	4 13	51	1 10	0-98	2-7
Brewers' grains, dried ale	6 0	0 10	5 10	48	2 3	1-21	12-5
" " " porter	5 12	0 10	5 2	48	2 1	1-12	12-5
Dried sugar-beet pulp (a)	5 10	0 5	5 5	66	1 7	0-85	5-2

(a) Carriage paid in 5 ton lots. *At Bristol. †At Hull. ‡At Liverpool.

‡ In these instances manutrial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of September, 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manutrial value is 18s. per ton as shown above, the cost of food value per ton is £9 2s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 6d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.12d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manutrial value per ton are calculated on the basis of the following unit prices:—N, 6s. 7d.; P₂O₅, 2s. 1d.; K₂O, 2s. 6d.

MISCELLANEOUS NOTES

Advisory Leaflets

SINCE the date of the list published in the August, 1934, issue of this JOURNAL (p. 513), the undermentioned advisory Leaflets have been issued by the Ministry:—

- No. 42. The Codling Moth. (Revised.)
- No. 69. Cabbage Butterfly Caterpillars. (Revised.)
- No. 70. Cabbage Moth Caterpillars. (Revised.)
- No. 109. Flea Beetles. (Revised.)
- No. 113. Chicken Rearing. (Revised.)
- No. 212. Nest Boxes for Birds.
- No. 216. Cultivation of the Vegetable Marrow.
- No. 217. Seakale Cultivation.
- No. 218. Dry Rot of Potatoes.
- No. 219. Grain Weevils.
- No. 220. Barley Growing.
- No. 221. Scalded Cream.
- No. 222. Cream Cheeses.

Copies of any of the above-mentioned leaflets can be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Sale Offices of that Department at Edinburgh, Manchester, Cardiff and Belfast, price 1*d.* each net (1½*d.* post free), or 9*d.* net per doz. (10*d.* post free).

Single copies of not more than 20 leaflets can, however, be obtained, free of charge, on application to the Ministry. Further copies beyond this limit must be purchased from H.M. Stationery Office, as above.

A selected list of the Ministry's publications, including leaflets, on agriculture and horticulture can be obtained free and post free on application to the Ministry.

The Agricultural Index Number

THE September index number of the prices of agricultural produce at 119 (corresponding month of 1911-13 = 100) was the same as for the previous month, but was 12 points higher than for September, 1933, and 15 points above that for September, 1932. Higher prices were realized for wheat, barley, oats, potatoes and hay, but these increases were offset by reductions in fat cattle and sheep, butter and eggs.

Grain.—Wheat again averaged 5*s.* 1*d.* per cwt., but, as a decrease in prices occurred between August and September

MISCELLANEOUS NOTES

of the base period, the index rose by 4 points to 68. If allowance is made for the "deficiency payment" under the Wheat Act, 1932, the index would be increased to approximately 127, the effect of which would be to raise the general index for agricultural produce from 119 to 123. As is usual at the opening of the barley season, values of new crop showed a substantial advance. The average price for the month under review was 1s. 3d. higher than in August and the index was 4 points higher at 127: a similar rise in price and index occurred also at the corresponding period last year. Oats at an average of 6s. 7d. per cwt. were 2d. dearer and the index appreciated by 6 points to 98, or just below the pre-war level. In September, 1933, oats were selling at an average of 5s. 3d. per cwt., or 22 per cent. below pre-war.

*Monthly index numbers of prices of Agricultural Produce.
Corresponding months of 1911-13 = 100.*

Month.	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	108
April	146	137	123	117	105	111
May	144	134	122	115	102	112
June	140	131	123	111	100	110
July	141	134	121	106	101	114
August	152	135	121	105	105	119
September	152	142	120	104	107	119
October	142	129	113	100	107	—
November	144	129	112	101	109	—
December	143	126	117	103	110	—

Live Stock.—Fat cattle were cheaper during September, the average of about 34s. 9d. per live cwt. for second quality declining by 1s. 2d., and the index fell by 2 points to 104: a year ago the index was 99. Fat sheep were ½d. per lb. cheaper and the index moved downwards by 4 points to 124; in September, 1933, the index stood at precisely the pre-war level. Bacon pigs, following upon last month's rise, were 2d. per score cheaper, and the index at 102 was only one point above that of September, 1933. On the other hand, porkers were 5d. per score dearer, the index advancing 1 point to 109 or 3 points above a year ago. Store stock, as is usual at this season, were dearer, but as the increases were proportionately greater than in 1911-13, the indices for all four classes were higher.

Dairy and Poultry Produce.—Wholesale contract prices for the sale of milk as liquid during September were the same as in August, and the index at 168 was unaltered.

MISCELLANEOUS NOTES

Butter averaged $\frac{1}{4}$ ¢. per lb. less and the index was 5 points lower at 87. Cheese realized slightly higher prices during the month under review, but as this increase was proportionately smaller than that which occurred in the base period, the index declined 2 points to 94. Contrary to the normal seasonal movement, quotations for eggs declined during September, and this was reflected in a fall of 16 points in the index to 103. Prices for fowls and ducks continued to fall, but geese were again dearer, and the combined index for poultry increased by 1 point to 117.

Other Commodities.—In the case of potatoes, there is a change over from earlies in August to main crop in September. Prices declined during the month under review, but as this fall was less pronounced than that in the base years, the index advanced 5 points to 158, whereas a year ago there was a rise from 91 to 99. The upward movement in hay prices has continued, and the combined index for September was 3 points higher at 104. Wool was a shade cheaper, but the index was unaltered at 87. Apples and plums were cheaper than at the corresponding period last year, but pears made similar prices to those of a year ago.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1932	1933	1934			
	Sept	Sept	June	July	August	Sept.
Wheat	76	63	67	66	64	68
Barley	103	129	96	98	123	127
Oats	96	78	83	83	92	98
Fat cattle	112	99	94	99	106	104
" sheep	86	100	138	128	128	124
Bacon pigs	84	101	110	105	103	102
Pork	87	106	113	108	108	109
Dairy cows	112	110	101	104	104	105
Store cattle	109	94	87	85	85	88
" sheep	80	83	109	108	104	113
" pigs	86	132	135	135	139	142
Eggs	124	115	100	97	119	103
Poultry	124	121	126	114	116	117
Milk	150	160	162	168	168	168
Butter	94	98	87	87	92	87
Cheese	116	110	108	90	96	94
Potatoes	114	99	82	136	153	158
Hay	69	73	88	91	101	104
Wool	62	76	82	86	87	87

Revised index numbers due to Wheat Act payments.

Wheat	131	127	120	118	119	127
General Index	108	111	114	117	123	123

MISCELLANEOUS NOTES

Export of Breeding Stock

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland during the three months ended June, 1934, compared with the corresponding period of 1933. (From returns supplied by H.M. Customs and Excise.)

	April to June, 1934		April to June, 1933	
	Number	Declared Value	Number	Declared Value
CATTLE				
Argentina	54	£ 9,500	60	£ 14,055
Netherlands	10	950	—	—
Uruguay	2	130	12	973
Australia	20	5,351	5	1, 6
Canada	2	280	11	1,166
Irish Free State	103	2,039	94*	2,430*
Kenya	2	82	1	40
New Zealand	1	220	—	—
Southern Rhodesia	1	140	2	350
Union of South Africa	23	1,496	3	295
Other countries	2	102	7	450
Total	220	20,290	195*	20,824*
SHEEP AND LAMBS				
Belgium	2	20	—	—
Brazil	1	20	28	940
Chile	—	—	10	310
France	17	381	—	—
Italy	2	50	—	—
Australia	15	365	—	—
Kenya	11	74	—	—
Newfoundland	30	88	—	—
Union of South Africa	12	113	3	33
Other countries	1	11	2	40
Total	91	1,122	43	1,323
SWINE				
Brazil	4	170	15	120
Chile	6	120	—	—
France	24	294	—	—
Japan	2	139	—	—
Morocco	4	90	—	—
Canada	75	580	—	—
Irish Free State	28	180	10	182
Newfoundland	—	—	16	53
Union of South Africa	1	30	—	—
Other countries	3	70	6	81
Total	147	1,673	47	436

* Amended figures

miscellaneous notes

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at Kings Buildings, Smith Square, London, S.W.1, on October 22, 1934, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders:—

Cambridgeshire and Isle of Ely.—An Order fixing minimum and overtime rates of wages to come into force on November 1, 1934 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until February 28, 1935. The minimum rates are: for male workers of 21 years of age and over employed wholly or mainly as horsemen, cowmen or shepherds (other than workers employed solely as stockmen or yardmen) 37s. 6d. (instead of 37s. as at present) per week of the hours necessary for the performance of their customary duties; for other male workers of 21 years of age and over, 30s. 6d. (as at present) per week of 48 hours, except in the week in which Christmas Day falls, when the hours are 40, with overtime at 9d. per hour on weekdays and 11d. per hour on Sundays and Christmas Day (instead of 8d. and 10d. respectively as at present); and for female workers of 18 years of age and over, 5½d. per hour with overtime at 7d. per hour as at present.

Cheshire.—An Order fixing minimum and overtime rates of wages to come into force on November 1, 1934 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until October 31, 1935. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (instead of 31s. as at present) per week of 54 hours with overtime at 8½d. (instead of 8d. as at present) per week. For female workers of 18 years of age and over the minimum rate is unchanged at 6d. per hour for all time worked, provided that in the case of female workers engaged for milking, such workers shall receive not less than 6d. per "meal" (i.e., on each occasion on which the worker visits her place of employment for the purpose of milking).

Northamptonshire and Soke of Peterborough.—An Order fixing minimum and overtime rates of wages to come into force on October 28, 1934 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until April 27, 1935. The minimum rates for male workers of 21 years of age and over are 30s. per week of 48 hours (instead of 50 as in 1933) in winter, except in the week in which Christmas Day falls when the hours are 39½ (instead of 41 as in 1933) and 50 hours in summer, except in the week in which Easter Monday falls when the hours are 41, with overtime at 9d. per hour on weekdays and 11d. per hour on Sundays, Christmas Day and Easter Monday. The minimum rate for female workers of 18 years of age and over is 6d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays, Christmas Day and Easter Monday.

Carmarthenshire.—An Order fixing minimum and overtime rates of wages to come into force on November 15, 1934 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until November 14, 1935. The minimum rates for male workers of 21 years of age and over are 31s. 6d. (instead of 31s. as at present) for a 7-day week of 54 hours with overtime at 8½d. per hour, and for female workers of 18 years of age and over 5d. per hour with overtime at 6d. per hour.

Radnor and Brecon.—An Order fixing minimum and overtime rates of wages to come into force on November 1, 1934 (i.e., the day

MISCELLANEOUS NOTES

following that on which the existing rates are due to expire), and to continue in operation until April 30, 1935. The minimum rates for male workers of 21 years of age and over are 30s. (instead of 29s. 6d. as at present) per week of 50 hours in winter and 54 hours in summer, with overtime at 9d. per hour. For female workers of 18 years of age and over the minimum rate is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

Enforcement of Minimum Rates of Wages.—During the month ending October 14, 1934, legal proceedings were taken against seven employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.	Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
		£ s. d.	£ s. d.	£ s. d.	
Lincoln : Holland ...	Boston ...	3 0 0	1 2 6	27 7 6	3
Gloucester ...	Cheltenham	5 0 0	—	55 4 11	1
Yorks, W.R. ...	Bradford ...	2 0 0	0 5 0	36 14 7	1
" ...	Ripon ...	0 10 0	0 2 6	30 6 2	1
" ...	Saddleworth ...	0 15 0	0 7 0	22 10 0	1
Anglesey and Caernarvon .	Caernarvon ...	1 0 0	0 13 6	5 0 0	1
Pembroke and Cardigan ..	Llanilar ..	3 0 0	—	17 9 8	1
		15 5 0	2 10 6	194 12 10	9

The National Diploma in Dairying, 1934.—The 39th annual examination for this Diploma was held by the National Dairy Examination Board in September. English and Welsh candidates were examined at Reading (the University and British Dairy Institute); and Scottish candidates at Auchincruive, Ayr (the Dairy School for Scotland). The results are as follows:—

	<i>Reading. Auchincruive. Total.</i>		
Candidates	57	40	97
Awarded the Diploma :			
Women	17	7	24
Men	15	14	29
	32	21	53

No candidate at either centre obtained Honours.

All the successful candidates at the Auchincruive centre had been trained at the Dairy School there. Of the 32 successful candidates at Reading, 2 came from the University College of Wales, Aberystwyth; 2 from the East Anglian Institute of Agriculture, Chelmsford; 4 from the Lancashire County Council Dairy School, Hutton, Preston; 2 from the Midland Agricultural College, Sutton Bonington; 8 from Seale-Hayne Agricultural College, Newton Abbot; 1 from Studley College (for Women), Warwickshire; and 13 from Reading University and British Dairy Institute.

The Examiners at both centres were Messrs. Alex. F. Smith, N.D.A., N.D.D., C.D.D.; Edward Capstick, M.C., M.Sc., N.D.A., N.D.D. (Hons.); T. J. Drakeley, D.Sc., Ph.D., F.I.C.; A. T. R. Mattick, B.Sc., Ph.D.; and James Wyllie, B.Sc.; N.D.A. (Hons.), N.D.D.

APPOINTMENTS

Lectures on Soils.—Under the title of "Pedology in Relation to Agriculture," a course of three lectures will be delivered on November 5, 7 and 9, 1934, by Dr. S. Graham Brade-Birks, Head of the Department of Zoology and Geology, South-Eastern Agricultural College, Wye, Kent. This course, part of the special lectures in agriculture arranged by the University of London, will be given at the Imperial College—Royal School of Mines, Prince Consort Road, South Kensington, London, S.W.7. The lectures, which will begin at 5.30 p.m. each day, will be illustrated with lantern slides, soil monoliths and other specimens, and are addressed to all interested in the problem of soils as affecting agriculture. Admission is free, without ticket.

Wireless Talks to Farmers in November.—The National talks will, as usual, be of a topical character, and Mr. John Morgan continues his discussions with various farming experts. From Scottish Regional, there will be two talks on November 8 and 22 respectively. The first will be by Lord Rowallan on "Milking Recording and its Benefits and Extension"; and the second, by Mr. J. P. Ross Taylor, will be on "Parliament and the Farmer." These talks will begin at 6.45 p.m.

From the Midland Station, a series for farmers in that area will be given on Thursday evenings by Mr. W. B. Thompson.

The West Regional Station will continue the regular features:—"For Western Farmers in Particular" and the other is the monthly "Market Special"

APPOINTMENTS

County Agricultural Education Staffs

ENGLAND

Derbyshire.—Mr. G. Dunlop, B.Sc., N.D.A., N.D.D., has been appointed Lecturer in Animal Physiology and Hygiene, *vice* Mr. G. B. Brook, M.R.C.V.S., B.Sc.

Essex.—Mr. D. J. Ewing, B.Sc., has been appointed Senior Lecturer in Agriculture, *vice* Mr. A. Hay, N.D.A., N.D.D.

Mr. H. E. Nichols, B.Sc. (Agric.), has been appointed District Lecturer in Agriculture and Assistant Agricultural Organizer, *vice* Mr. D. J. Ewing, B.Sc.

Miss B. Lang, N.D.P., has been appointed County Poultry Instructor, *vice* Mr. A. E. Holman, N.D.P., F.B.S.A.

Suffolk West.—Mr. J. I. Littlewood, N.D.A., N.D.D., has been appointed Assistant Agricultural Organizer.

NOTICES OF BOOKS

A Summary of Food Laws and Regulations. By C. L. Hinton, F.I.C. Pp. vii+90. (London: The Nema Press Ltd. 1934. Price 2s.)

This book, written by a member of the British Association of Research for the Cocoa, Chocolate, Sugar, Confectionery and Jam Trades, is intended to simplify the task of the food manufacturer in his interpretation of the technical requirements of food legislation at home and abroad. It consists of three parts: (i) the text giving a critical survey of the regulations, (ii) a transcript of the laws of the United Kingdom as affecting the manufacture of foods together with the schedule of jam standards of the Food Manufacturers Association, and (iii) tables in which for each country there are enumerated for each class of food, the statutory requirements in respect of natural composition, colouring matters, preservatives, artificial sweeteners, metallic and other contamination, wrapping materials, and other matters relating chiefly to labelling and statement of net weight. Throughout the work "quality" in food is taken to mean those attributes which can usually be defined in chemical terms and which are, therefore, susceptible of control in the manufacturing process. Statutory definitions of minimum standards of quality are welcomed as affording an index to the requirements of the markets at home and overseas and because individual manufacturers adhering to a high standard are better protected from the competition of inferior products. Nevertheless, attention is drawn to the small measure of agreement existing among the various countries especially with regard to numerical standards for dairy and cacao products, and to the universal failure to define with any exactness what is meant by the terms sugar confectionery, pastry and biscuit respectively.

An excellent survey of the various methods of formulating jam standards draws upon the experience of legislators in the United States, Canada, Germany and Holland, and it is interesting to find the English standards dismissed from consideration as being "thoroughly familiar to home manufacturers." Due prominence is given in the respective chapters on Preservatives and Colouring Matters to the improvement of appearance and the prevention of deterioration by the use of added substances without prejudice to the wholesome character of the food. It is the author's opinion that the principle is accepted that preservatives, even where permitted, are not used to conceal unsoundness or inferiority in the original foodstuff. Labelling is considered in relation to the development of carton packing, the tendency of which to hide the food from inspection at the time of purchase is throwing the onus of description on the manufacturer who packs the food. Declaration on the label of the degree to which there is departure from the natural or normal state of the ingredients of the article of food, is regarded as indispensable, but the author concludes that an adequate definitive system would save the label from being overburdened with detail. He expresses the view that if any ingredient falls short of the standard it should not legally be offered for sale, and that from the standpoint of the consumer no amount of declaration of the shortcomings would make the matter good.

In the preface the Editor of "Food," a periodical in which some of the text of the book has already appeared, commends the work as a pioneer effort and invites constructive criticism. To this end it is suggested that in the tables reference to the Acts and Regulations that are the source of the information would prove helpful to manufacturers desiring to acquaint themselves with administrative as well as with such technical points as have not been the subject of detailed treatment in the book.

NOTICES OF BOOKS

Australia as Producer and Trader, 1920-1932. By Nancy Windett, B.Sc. Pp. xvi+320. (Oxford: University Press. 1933. Price 15s.)

The post-war development of Australian industries and overseas trade is very clearly set out in a series of chapters dealing with the various products of agriculture, mining and manufacturing. A comprehensive appendix provides an adequate background of statistical material. It is clear that many authoritative sources have been consulted in the preparation of this study.

The author anticipates increasing export surpluses of butter and processed milk, larger exports of meat, fruit, and minor products such as wines, etc., and the possibility of an improvement in the present exports of wheat at prices little higher than the present level.

Australia's sugar policy is criticized and also the general policy of high tariffs, particularly with reference to the iron and steel industry, the cost of living, and the cost of production in agriculture. The view is expressed that the extension of dumping, as, e.g., of sugar and butter, may "undermine the whole basis of Imperial preference." On the other hand, there may be no significance in this point since elsewhere the author says that "to attempt artificially to govern the flow of goods between British countries is . . . in the long run, doomed to failure."

In a study of this kind, one could perhaps prefer that, although designed to stimulate thought, criticisms, forecasts and opinions, whether personal or those of authorities consulted, should be kept distinct and entirely apart from the main picture as presented by the facts. The problem is not a simple one, however, and the author admits that any realist view of the economic situation must have regard to the political significance of a "white Australia," where a population smaller than that of London occupies a country as large as the United States. It is probable that, were the population of Australia to increase at the rate of one million a year, as in Japan, instead of only one million in ten years, as at present, the internal trade would so far increase as to alter in large measure in a very short time her present character as a producer and trader.

Practical Animal Husbandry. By William C. Miller, M.R.C.V.S., F.R.S.E., and E. D. S. Robertson, M.R.C.V.S. Pp. xv+316, and 122 figs. (Edinburgh: Oliver & Boyd. 1934. Price 12s. 6d.)

This book is essentially practical, and well illustrated with diagrams and photographs. It deals in detail with the manipulation and restraint of animals, stable management, clothing, harness and shoeing of horses. The majority of writers on the subject devote relatively little attention to horses, and in adjusting the balance the authors of this work restrict their public to veterinary students and to those concerned with and interested in horses. The essential factors in the management of cattle, sheep, goats and poultry are treated in a concise manner.

Farm Machinery. By A. A. Stone. Pp. xii+466, and 285 figs. London: Chapman & Hall Ltd. 1934. Price 18s. 6d.)

The study of farm machinery in its theoretical aspect must be increasing with the same rapidity that is characterizing the development of farm mechanization in practice, because it is only some six years since the first edition of this book was published.

The author's design is to provide a complete handbook for the student as well as for the practical farmer, and he has succeeded quite adequately in achieving it. The whole range of farm machines is described, and anyone who wishes to learn about them will find in this work a complete description of each machine, of all its parts and of the mechanical operations involved. Moreover, the book is profusely illustrated, and anyone who wishes to maintain his equipment in good working order and to learn the best methods of securing this end, cannot do better than to study this treatise. The work is divided

NOTICES OF BOOKS

into two parts, the first dealing with farm implements and the second with the perhaps more complicated subject of the farm tractor, which demands a more exact mechanical knowledge than most implements for its maintenance.

Modern Flower-Growing for Profit. By W. E. Shewell-Cooper, N.D.H., F.L.S., F.R.H.S. Pp. 195. (London: Ernest Benn Ltd. 1934. Price 5s.)

There are many books on flower growing, but practically all concern flower growing in private gardens, and though the commercial grower may spend much time in reading these he finds only fragments of information that can be utilized. Commercial flower growing is different, for few writers have devoted any attention to it. It is therefore fortunate that Mr. Shewell-Cooper, whose experience includes both writing and flower growing, should give us a volume on the growing of outdoor flowers for market. To keep the book complete and reasonably cheap the material had to be restricted to the bare outlines, and only essential facts on each plant and its cultivation are set out, though for some flowers, such as Chrysanthemums and Gypsophila, a more detailed treatment is given, so that a mere novice would be able to grow these flowers with a reasonable chance of success. A commercial grower of flowers needs a knowledge not only of flowers but of the manures used in fertilizing the land, the machines for cultivation and the ways of preparing the different flowers for market and marketing. The book contains chapters on all these topics, and they are particularly useful because they include notes of the writer's actual experience in growing and marketing flowers.

Veterinary Hygiene. By R. G. Linton, Ph.D., M.R.C.V.S. Second Edition. Pp. xix + 472, and 129 figs. (Edinburgh: W. Green & Son Ltd. 1934. Price 21s.)

The new edition of this well-known work is divided into six sections dealing with the following subjects:—Water, Meteorological Phenomena and Instruments, Sanitation, Air and Ventilation, Building Construction and Control of Disease. The author has collaborated with specialists in the various subjects with which he has dealt. The section on Sanitary Law has been omitted, but sub-sections have been added on some contagious diseases of poultry, the housing of poultry, and dog kennels. Under the title "Sanitation" detailed information is given concerning drainage systems and the disposal of sewage. The section on "Building Construction" covers various aspects of the subject as applied to animals, and that on "Control of Disease" deals with diseases notifiable under the Diseases of Animals Acts and Orders in Great Britain, incidentally referring to disinfections and disinfectants and the disposal of carcasses. The book is well illustrated, and the information given should be of great assistance to veterinary surgeons and stockowners.

Weed Suppression by Fertilizers and Chemicals. By H. C. Long, B.Sc. Introd. by Sir Daniel Hall. Pp. 57 and 23 figs. (Obtainable from the Author, "The Birkins," Orchard Road, Hook, Surbiton, Surrey. 1934. Price 2s., by post 2s. 2d.)

Force of circumstances has compelled farmers to resort to chemical methods for weed destruction as being quicker and less laborious than hand weeding, and a great advance on just leaving a crop to wage an unequal struggle with an aggressive and insidious competitor. Such methods are not intended to displace but to supplement well-timed cultivations by attacking such weeds as spring up from seed at times when ordinary cleaning methods are impracticable. Some of the chemicals used are directly toxic, e.g., sodium chlorate: others depend for their action on being able to scorch up the weed by withdrawing water from the plant cells. Weeds with hairy leaves or of rosette formation retain such substances longer than, e.g., the narrow smooth upright leaves of cereals, and can therefore be destroyed

NOTICES OF BOOKS

while the latter escape practically unscathed. Some of the substances now used, such as sulphate of ammonia and calcium cyanamide, are both weedicides and crop stimulants. Thus an application in spring may serve a double purpose at a single cost. In this little book the author has summarized in concise, readable, and practical form the voluminous literature on weed destruction that has accumulated throughout the world. It can be recommended with confidence to all interested in the subject.

Brewing and Malting. By J. Ross-Mackenzie, F.C.S., F.R.M.S. 3rd ed. Pp. xvi + 182, and 66 figs. (London: Sir Isaac Pitman & Sons Ltd. 1934. Price 10s. 6d.)

The demand for a simply written account of the processes of malting and brewing is proved by the publication of the third edition of this little book. It provides an outline suitable for the general reader, but it can hardly be claimed that it goes further than this. Undoubtedly a great deal of technical information has been compressed into the limited space available, but it would be impossible to describe in any detail the intricate processes of malting and brewing in 30 and 115 pages respectively, much less to discuss the underlying scientific principles. Unfortunately, even what is included is not always up to date. Barley growers may be rather surprised to find that "so far as the British climate with its lack of sunshine and low ripening power is capable of producing a barley possessing the condition named, varieties of Chevalliers, Goldthorpe, Archer, and Standwell are the best examples. Goldthorpes are grown on heavy soil and are cultivated principally in Scotland and Yorkshire. Archer and Archer-Spratt barley hails from the Eastern counties and ripens later than other classes." Apparently Plumage-Archer is of little account, and such scrappy information regarding what the brewer actually requires is not of great help to growers. Considerably greater space is allotted to hops, but even in these pages the requirements of brewers are not dealt with very adequately. Photographs of the cones of 15 varieties of hops are included, but of these a number are now rarely if ever cultivated, and it is stated that the "three principal sorts of hops now cultivated are Fuggles, Bramblings, and Mathon in this order." Turning to the technical aspects of malting and brewing the reader is similarly faced by lack of information which he would desire, and the need to use a certain amount of discrimination in order to eliminate the ancient from the modern. In the last chapter, 18 pages are devoted to "a glossary, in an abridged form, of some of the least known terms appertaining to brewing and malting." The selection of terms, for which more or less accurate definitions are given, is so strange as to make one wish that the space had been devoted to amplify more important sections of the book.

The Rural Exodus in Germany. (London: P. S. King & Son, Ltd., for the International Labour Office, Geneva, and the International Institute of Agriculture. 1934. Price 3s. 6d.)

This publication records the result of investigations undertaken in May, 1931, by Dr. H. Böker and F. W. von Bülow in Pomerania, the Prussian province of Saxony, and the Free State of Saxony. These regions are 75-85 per cent. arable, and the main crops are rye, oats, and potatoes. The holdings are mostly medium-sized and are cultivated by owner-occupiers. Very little mechanization has yet been introduced. Undivided succession after the owner's death is the rule. In these and other respects the areas investigated are fairly typical for Germany as a whole, and Eastern Germany particularly.

The complete and accurate statistics for rural exodus take us only up to 1925. At this date the population dependent on agriculture had fallen on the average by 3-4 per cent. as compared with pre-war. At the same time population occupied in agriculture had risen by 12 per cent. Apparently there had been an exodus of independent (hired) labourers and a marked decline in the number of young people.

NOTICES OF BOOKS

Production had been concentrating itself in the hands of the peasants and the older members of their families.

From 1925 to about 1930, these trends became accentuated. The migration of independent labour went so far as to cause a shortage of several classes of workers at the wages offered:—young workers, farm servants, stockmen, deputies for labourers' wives. Among the contributing factors to this movement we may note the declining birth rate, the quota on imports of foreign labour, the operation of the unemployment insurance and tenants' protection legislation, and the pull of local industry.

Since the depression these tendencies have reversed themselves. There has been a marked return movement towards the country.

Evidently the root cause of the migration was the impact of foreign competition on German arable farming, coupled with the flourishing state of industry while Germany was still buoyed up by American loans. Agriculture could not offer wages that would hold the independent labourer or his children against the pull of the towns.

According to the authors there are three types of rural exodus. The first is merely a draining off of surplus agricultural population and redresses the birth rate differentials between country and town. This is innocuous. The second type, which has not yet appeared in Germany, consists of the actual abandonment of farm land. The third type is an exodus of rural non-farm population deprived of economic support by agricultural adversity. Besides elaborating these distinctions the authors produce some interesting theoretical observations on the decline of rural industry, the relation of rural migration to mechanization, the substitution of industrial for animal and vegetable produce, the decline of local markets, and the subdivision of holdings.

The whole report looks very competent and careful. Chapter and verse are quoted for even the most passing observation. But what conclusions can be drawn? The authors are very chary of inferences. It might have aided them to produce generalizations had they attempted brief comparisons with the experience of other countries. Compared with Great Britain, Germany's rural exodus appears to have been accentuated by the following conditions: greater dependence on arable farming, especially on large estates; the vulnerability of the labourer to economic conditions where he is not protected in part by the "squeezability" of landlord and tenant; and—between 1924 and 1929 in Germany—the short-lived boom in heavy industry.

Grass-land Seeds. XXVIIth Report of the Imperial Economic Committee. Pp. 75. (London: His Majesty's Stationery Office. 1924. Price 1s., post free 1s. 2d.)

The subject dealt with in this Report is of vital importance, since the products of grass land constitute such a large proportion of the wealth and trade of the Empire. The quality and character of the grass-land seeds available to the farmer influence a wide acreage of pasture in this country, because a considerable area is sown to fairly long duration temporary grass every year. The character of the seed, however, will assume an even greater importance in proportion as grass-land management becomes more intensified, and increasingly energetic steps (involving re-sowing) are taken to improve some of the more worthless of our permanent pastures.

All through the Report great emphasis is laid on the supreme importance of strain and of regional varieties—such as wild white clover. The contribution that the plant breeder is making, and still has to make, to grass-land seeds, is also fully recognized.

The fact that pedigree has definitely come into the sphere of grass-land seeds is squarely faced, and the difficulties that must necessarily arise to ensure abundant and true-to-type supplies of such seeds are dealt with in a purposeful and highly suggestive manner.

Some form of organization and control is regarded as inevitable, and the various plans adopted in other countries are discussed in

NOTICES OF BOOKS

detail. Schemes of certification have been initiated in New Zealand with every promise of success, and in this country a scheme is in operation relative to wild white clover. Perhaps the most thorough plan is that adopted by Sweden, where the Swedish General Seed Company co-operates with the plant breeder (in effect the station at Svalöf) in the matter of seed production. Provided, however, that sufficiently large quantities of stock seed are produced under the direct supervision of the plant breeder, it should not be a difficult matter to ensure adequate growing-on by growers' associations, and by the more enterprising of the seed houses. One essential, however, is that the Empire research stations that are concerned with the breeding of grass-land plants should maintain the necessary seed production farms under their own supervision, and this need is emphasized in the report.

Our dependence on non-Empire countries for certain sorts of grasses and clovers is insisted upon, as is the unsatisfactory nature (for sward formation) of some of the varieties and strains annually imported. In this connexion the question of staining is brought under review, and it is shown that without the adoption of any wholesale system the effect of a well-considered scheme of staining in respect of certain species in particular would probably be beneficial. Important suggestions are also made for the better categorization of grassland seeds in the trade returns.

The Committee have contented themselves with a general review of the subject, and have not attempted to formulate hard-and-fast plans. To have done so would undoubtedly have been premature, but none the less, it is made abundantly clear that a complete change in point of view will have to dominate the trade in grassland seeds. Fortunately the change has begun to show itself, and, as the Committee remark, " those countries in which the production and distribution of herbage seed have been organized on a strain basis will enjoy a double advantage the benefit to be derived from improved pastures and an increased share in the trade of herbage seed."

Bird Food Charts. Nos. 1-16. (London: Royal Society for the Protection of Birds. Price 4d. each; series of 16 by post 4s. 4d.)

The Bird Food Charts, published by the Royal Society for the Protection of Birds, not only provide excellent illustrations of the birds themselves, but show in colour the percentages of various kinds of food taken by the different species, thus furnishing useful information as to the economic status of the birds considered. The figures given are based principally on the investigations of Dr. W. E. Collinge, and are quoted by permission from his work, "The Food of Some British Wild Birds." The volumetric method of food examination advocated and practised by Dr. Collinge has its detractors, but although there is no known means of assessing with certainty the exact potentiality of any bird for economic good or ill, the volumetric method is probably the most reliable at present in use.

The coloured drawings of the birds are by Mr. Roland Green, a fact that is in itself a recommendation; and the charts should have a ready sale among bird lovers, and for use in schools and other educational institutions. It is to be hoped that the Society may find it possible to extend the series.

Changes in Quality Values of Farm Machines between 1910-12 and 1932. By J. B. Davidson, G. W. McCuen, and R. U. Blasingame. Pp. 165. Illus. (St. Joseph, Michigan: American Soc. of Agric. Engineers. 1933. Price 50c.)

Farm mechanization can be measured by two rules: the one, the absolute increase in the number of machines available to and used on farms; and the other, the improvement in design and quality in types of machines that have been long on the market.

NOTICES OF BOOKS

It was in order to determine the improved quality value embodied in the modern cost of farm machines for purposes of comparison with an earlier period that the inquiry, the results of which are set out in this report, was undertaken. Improvements in design, material and construction have been very marked in the past two decades, and the authors estimate the improved value of some twenty-five modern farm machines as ranging between 40 and 115 per cent. over pre-war standards.

The machines studied were ploughs, harrows, cultivators, hay rakes, loaders, binders, mowers, threshers, drills, manure spreaders, cream separator, food grinder, ensilage cutter and two-nozzle sprayer. The machines used for the maize crop in America are not of such immediate interest to the British farmer, but the improvements they show nevertheless illuminate the general nature of the development that has taken place.

The report is profusely illustrated, not only with photographs of complete implements and machines, but also of those parts that have been modified in the light of modern farm practice and engineering design. In addition, there is a detailed written report on each machine, giving a full comparative specification of both the old and new patterns, thus affording material for a ready and complete comparison that enables the writers' conclusions to be fully appreciated.

A 3-h.p. farm engine is included in the report, but the farm tractor has been deliberately excluded because of its late development. The demands that its introduction has made for modifications in the design of the usual farm implements have not, however, been neglected.

Le Régime Agraire en Angleterre au XIX^e Siècle. (*The English Agricultural System in the 19th Century.*) By Dr. P. Flavigny. Preface by Professor R. Picard. Pp. 271. (Paris: Les Editions Internationales, 4 bis, rue des Ecoles, 1933.)

Very great credit is due to Dr. Flavigny for this production. The difficulties that confront a foreigner in understanding the social and economic organization of another country are not only those of language, but also those included in the preconceived notions that arise inevitably out of his native social environment and education. Dr. Flavigny has overcome these difficulties.

It is not too much to say that a great deal of English economic history has been written with the idea that the enclosure movement commenced about the middle of the 18th century and was completed by its end, whereas practically as large an area was enclosed during the first half of the 19th century as during the second half of the 18th. Dr. Flavigny's work does very much to correct the misconception, and his study is conducted with meticulous accuracy. He surveys the country, not in wide general terms, but in terms of restricted localities in which similar conditions of soil and climate have led to similarities of development, both historical and economic. It is, of course, upon well-known examples of survival of the open field system that the evidence is primarily based, but in addition to those parishes well known to every student of the subject Dr. Flavigny has drawn from a wide range of lesser known material.

The book is arranged in an extremely logical manner, as one might expect from the nationality of its writer. It opens with a description of the open field village at the beginning of the 19th century, and a discussion of the counties in which the system survived, with the modifications introduced during its long history. In general this author follows the conclusions set out in Herman Levy's *English Field Systems*, as far as the general distribution of methods of cultivation and land holding are concerned.

The natural consequence of a discussion of the modifications in the structure of the open field village is to pass on to the meaning of the word "enclosure," and the various methods by which enclosures have

NOTICES OF BOOKS

been made at different times. Thence the author passes to a description of the relation between the enclosures of Dr. Flavigny's own period and the geological structure of the soil, a subject that has been touched upon, but not exhaustively treated, by previous writers. During the whole period of enclosure a large area has been taken into severalty without the assistance of any legal process, and from this study we may gather that non-Parliamentary and Parliamentary enclosure were proceeding possibly at an almost equal rate during the 19th century. The question is discussed in relation to the individual counties, and statistics of the Parliamentary enclosures of that period are provided, showing their incidence in different parts of the country.

Perhaps one of the most important effects, or at least the one that has been most widely discussed in relation to enclosure, is the impoverishment of the smallholder and the cottager, and his relegation either to the ranks of wage earners or daily labourers, or to unemployment. Naturally, therefore, follows the necessary discussion of the effect of the 19th century enclosures upon the average size of the holding, completed by a description of the new methods of agriculture consequent upon the increasing size of the holding. The argument is supported by adequate statistics, in which the average size of holding in a large number of counties is set out. The whole is concluded by a consideration of the distribution of pasture and arable farming throughout the country.

It is not too much to say that this study very adequately satisfies a need that students of agricultural history must have often experienced.

The Experimental Production and the Diagnosis of Frost Injury on Forest Trees. (Oxford Forestry Memoirs, No. 16.) By W. R. Day, B.Sc., M.A., and T. R. Peace, M.A. Pp. 60 and 54 figs. (Oxford: Clarendon Press. London: Humphrey Milford. 1934. Price 6s.)

It is perhaps not generally recognized that frost is likely to cause injury to forest trees in England, yet it is actually a very common cause of damage. The realization of its importance led the Imperial Forestry Institute, Oxford, to embark in 1929 upon a thorough investigation of frost damage to trees. This memorandum contains an account of the first results written in a technical way that will make them available mainly for the scientific student of forestry or botany. By means of an experimental refrigerating chamber, frost damage was experimentally induced and the critical temperatures for different trees and strains, and their periods of susceptibility to frost damage, were estimated. Further, the abnormal anatomy of frost-injured parts was studied, for this knowledge is of fundamental importance before one can attempt the diagnosis of injuries attributed to frost damage and to estimate the importance of frost damage in connexion with the various fungal diseases with which it is associated.

Spring frosts are most important in England, because although during the period of winter dormancy English forest trees are hardy to winter cold, after the winter changes preparatory to growth taking place and the tree becomes susceptible to frost injury, parts may be killed, leaving evidence in the form of a dieback or canker. Similar injury may be caused by early autumn frosts after wood formation has ceased.

Next, the formation of new tissue begins in the buds and spreads down the stem, so that first the buds and new shoots, then the older shoots, and finally the large stems become increasingly susceptible to frost damage. Cankers around the buds, "frost rings" in the wood, or zones of abnormal wood result, the cause of the abnormal zones being the withdrawal of water from the developing (cambial) zone. The relation of frost damage to the occurrence of fungal diseases is noted and is to be the subject of further study.

The subject is of considerable importance to fruit growers, and deserves careful watching.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 9 December, 1934

NOTES FOR THE MONTH

Beet Sickness present in England

THE following note recording for the first time the occurrence of Beet Eelworm attack on sugar-beet in this country, has been communicated by Mr. F. R. Petherbridge, M.A., School of Agriculture, Cambridge:—

Continental growers have found to their cost that the repeated cropping of land with sugar-beet usually leads to a condition known as "beet sickness." At first this was thought to be due to the exhaustion from the soil of certain essential substances necessary for plant growth; later, however, it was found to be due to attacks of the eelworm *Heterodera schachtii*.

The reduction in yield brought about by this pest was so severe in Germany that, in 1876, 24 sugar factories were closed down. Shortly after its recognition as a serious pest in Germany, the eelworm was found to be widely distributed in France, Finland, Holland, Austria-Hungary, Bohemia and Western Russia. Since then it has become established in Belgium, Denmark and Sweden, and in 1906 it was found in the United States of America, where it now attacks large areas of sugar-beet.

At the request of the Informal Committee on Sugar Beet Education and Research, and with the concurrence of the Ministry of Agriculture and Fisheries, I visited the Continent during the past summer to study sugar-beet pests, and as the eelworm was found to be so widespread, a special search was made for it in this country immediately on my return. In this I was assisted by Mr. F. Hanley, the Advisory Chemist, who on November 21 brought in sugar-beet bearing cysts of the sugar-beet eelworm. Next day we visited the farm, situated near Chatteris in the Isle of

NOTES FOR THE MONTH

Ely, on which the beet had been grown. In *Field A* nearly all the beet were attacked by eelworm, and in parts of the field the attack was not apparent until the beets were lifted. At one end of the field the beets were very small and carrying masses of rootlets on which yellow and brown eelworm cysts were easily found. These plants were very easy to pull.

In *Field B* it was easy to find the eelworm cysts, but the attack was not apparent before lifting. A few mangolds growing in this field were also attacked. On two neighbouring fields belonging to other growers no eelworms were found.

Field C was on an off-farm about half a mile away, and here the eelworms were easily found.

These are the first recorded cases* of sugar-beet being attacked by the beet eelworm in England, and it is significant that the farm on which they were found has for some time given up the usual routine of rotation. For a number of years this farm grew large quantities of mangolds for sale off the farm. More recently sugar-beet has taken the place of mangolds for economic reasons.

Field A has grown sugar-beet every year for the last four years. This is exactly the procedure that brought about beet sickness on the Continent, and growers who in the past have cropped their land frequently with sugar-beet or mangolds should bear in mind that they are running the risk of "beet sickness" and consequently the lowering of the value of their land.

The eelworm that causes "beet sickness" is a small, microscopic, thread-like worm that bores its way into the roots, where it develops. Later the female is extruded from the roots but remains attached with her head in the roots. When fully grown the female—which is now called a "cyst"—is almost spherical and can be seen on the rootlets with the naked eye. The cysts are at first white, then yellowish, and later on brown in colour. They are full of eggs and remain in the soil—often for several years—until suitable conditions cause the eggs to hatch.

The beet eelworm is of the same species as the potato root eelworm (*Heterodera schachtii*) which causes potato sickness, but it is of a different race or strain and does not

* In 1928 Staniland and Walton recorded *H. schachtii* as attacking mangolds, cauliflowers, and a variety of weeds in Gloucestershire. Dr. M. J. Triffitt showed that this strain readily attacked sugar-beet.

NOTES FOR THE MONTH

attack potatoes; neither does the potato root eelworm attack sugar-beet. The beet strain of eelworm has been recorded as affecting sugar-beet, mangolds, spinach and allied weeds, such as fat-hen or goosefoot (*Chenopodium album*), as well as cabbages, turnips, mustard, radish, rape and certain cruciferous weeds such as charlock and shepherds-purse.

In fields where the attack is slight no symptoms are noticeable on the tops of the plants. As the eelworms increase, patches of undersized abnormal plants may be found. When plants are heavily attacked the outer leaves at first wilt in sunshine, and later on turn yellow and finally die. The heart leaves remain green but are undersized and an abnormal number of them are formed. In the case of very severe attacks these may die. The root symptoms are characteristic. A number of lateral roots called "hunger" roots are developed; these rapidly die and are replaced by new ones. A beard of roots is thus formed, and on these the eelworm cysts can be seen. Usually, the beet itself is not killed, but remains small and its sugar content is reduced.

The damage caused by this pest is much worse on light soils than on heavy soils. The pest is readily spread from field to field by earth adhering to farm implements, the boots of farm workers, the feet of animals, and by sugar-beet falling off carts and lorries. It can also be spread by surface drainage and streams. On the Continent it is commonly found near factories where the "washings" from the sugar-beet are put on the land.

Numerous experiments on the control of this pest have been carried out on the Continent, but with little success, and all observers agree that by far the most important means of dealing with it is by suitable rotations. The fact that cases of eelworm attack on sugar-beet have now been found in England should serve to emphasize the warning that has repeatedly been given against growing sugar-beet (or mangolds) year after year on the same land. *Farmers who contemplate sowing sugar-beet on land where it grew last year are advised to reconsider the position in the light of the above information.*

NOTES FOR THE MONTH

Report of the Agricultural Research Council

THE appointment of the Agricultural Research Council in 1931 initiated a new era in the scientific supervision of agricultural research in this country. The new body, which includes eminent authorities in branches of pure science related to agriculture, is able to survey the whole field of agricultural research in Scotland as well as England and Wales. Its first Report dealing with the work of the Council during the first two years of its life presents the result of that survey in the form of a critical view of the various branches of research.

The style is clear and simple, so that the Report may be read with pleasure and instruction, not only by the scientific man and the technician, but also by intelligent and interested laymen and farmers. A discussion of the organization and work in progress in the difficult subject of agricultural economics serves as a basis for comment on this country's agricultural policy. This is followed by comprehensive sections dealing with the present state of knowledge, and the position of current investigations, in each of the main branches of research, namely, those concerned with Soil, Plants, Animal Heredity and Genetics, Animal Physiology and Nutrition, Diseases of Animals, Dairy Research, Agricultural Engineering and Statistical Methods. It is invidious to make selections; the Report is full of interesting and valuable material.

Copies of the Report (Cmd. 4718) can be obtained either direct or through any bookseller from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 3s. net (3s. 3d. post free).

The Consumption of Milk in Cardiff

AN article by Messrs. W. H. Jones and W. J. Cowie in the *Welsh Journal of Agriculture* (Vol. X, Jan., 1934) contains valuable data on the quantities of milk consumed among various sections of the community in the Cardiff district. The survey was made in April, 1933, and covers 400 families in four districts of Cardiff respectively described as good middle class, good working class, new housing area and poor working class. At the time of the survey severe industrial depression prevailed in the city,

NOTES FOR THE MONTH

and this had the effect of curtailing demand in the last three districts. The price of milk was nominally 6*d.* per quart, but some dairymen were retailing at prices as low as 4*d.* and 5*d.*, the average price being approximately 5½*d.* per quart.

Daily *per capita* consumption of fresh milk averaged 0.29 pint, the respective group figures being:—good middle class 0.55 pint, good working class 0.27 pint, new housing area 0.19 pint, poor working class 0.16 pint.

The daily quantities of fresh milk bought by the various households were subject to large fluctuations; quantities taken on Sunday considerably exceeded the average for the week. This was most marked in the new housing area and poor working class districts, where the Sunday supply exceeded the average for the week by 90 per cent., and 86 per cent., respectively.

The survey was not confined to the consumption of fresh milk; information on processed milk was also obtained. Purchases of condensed whole milk were small; in the good middle class district these averaged 0.06 pint *per capita* per day, in the good working class district 0.05 pint, in the new housing area district 0.03 pint, and in the poor working class district 0.10 pint. Corresponding figures for condensed skimmed milk showed a considerable consumption of this commodity in the three poorer districts, viz., good working class 0.39 pint, new housing area 0.51 pint, poor working class 0.66 pint.

Brood Diseases of Bees

THE report of the Rothamsted Conference on Brood Diseases of Bees,* held in May last, was recently published. Attention is called to the fact that, in spite of the extensive researches that have been conducted on foul brood diseases of bees, the present stage of our knowledge regarding the cause, control and treatment of such diseases is inadequate. In the introduction, the development of bee disease investigations in Great Britain is traced, it being noted that, in this country, practically no work has been done on brood diseases since 1885, the information at present available being derived chiefly from the results of investigations con-

* *Brood Diseases of Bees*. Rothamsted Conference XVIII. Obtainable from the Rothamsted Experimental Station, Harpenden, Herts., price 1*s.* 6*d.*

NOTES FOR THE MONTH

ducted in other countries. It is emphasized that the investigation now in progress at Rothamsted was made possible largely through a fund raised by bee keepers themselves.

The distribution of brood diseases in England, as ascertained from replies to a questionnaire, is discussed. The information received, although undoubtedly of value, tends to show the necessity for an exhaustive survey of the incidence, varieties and methods of control of brood diseases. In addition, an historical account of the development of investigations on foul brood diseases of bees is presented, as well as a survey of the present scientific knowledge of the subject. The appendix contains descriptions, and the more usual methods of treatment, of the commonly recognized brood diseases, together with a useful account of the terminology employed.

Summing up the results of the Conference, Sir John Russell states that "nothing can be done with certainty until clear and accurate knowledge is obtained about the causes of the diseases and the life history and properties of the agents concerned." This definite information, it may be hoped, will emerge from the Rothamsted investigation which Dr. H. L. A. Tarr is now conducting.

Young Farmers' Clubs : Annual Cattle and Poultry Judging Competitions

Cattle Judging.—The annual dairy cow judging contest organized by the National Federation of Young Farmers' Clubs was held at the Dairy Show in London on October 24-25. Owing to the continued increase in the popularity of this event it was found necessary to restrict entries to one team from each administrative county.

In the preliminary contests on the first day teams representing 19 counties met and from them 9 teams and 13 additional individual competitors were drawn to participate in the final contest on the second day.

In the preliminary contests the teams were required to judge Dairy Shorthorns, Red Polls, Ayrshires and Jerseys. For the final contest the breeds were Dairy Shorthorns, Red Poll, Friesian and Guernsey.

NOTES FOR THE MONTH

The competition proved to be one of the best of the series, and was followed closely by a large number of interested visitors to the Show. The "Farmer and Stock-breeder" Silver Challenge Cup was won eventually by the team from Somerset. The excellence of the contest can be judged from the fact that the Surrey team was only 6 points behind. One silver and two bronze medals were given by the British Dairy Farmers' Association to the leading individual competitors.

Details of the scores of the most successful teams and individual competitors are as follows:—

<i>Preliminary Contests.</i>			
<i>Group 1.</i>	<i>Points.</i>	<i>Group 2.</i>	<i>Points.</i>
	<i>(Max. 1,080).</i>		<i>(Max. 1,080).</i>
Somerset ..	917	Devon ..	912
Northumberland ..	823	Gloucester ..	848
		Yorks, North Riding ..	847
<i>Group 3.</i>	<i>Points.</i>	<i>Group 4.</i>	<i>Points.</i>
	<i>(Max. 1,080).</i>		<i>(Max. 1,080).</i>
Hants ..	850	Warwick ..	806
Surrey ..	833	Notts ..	763
<i>Final.</i>			
<i>Teams.</i>	<i>Points.</i>	<i>Individual Competitors</i>	<i>Points.</i>
	<i>(Max. 1,080).</i>		<i>(Max. 360).</i>
Somerset ..	833	Betty Thomas (Surrey)	314
Surrey ..	827	D. L. Davis (Monmouth)	299
Gloucester ..	793	John Thompson (Durham)	298
Warwick ..	785	Peggy Busby (Bucks)	} 295
Devon ..	719	F. J. King (Somerset)	
Notts ..	716	Nora Rose (Wilts)	286

At the end of each contest the judges, Mr. John Evans, Mr. Robert Hobbs, Mr. Roger Sayce, and Professor J. A. S. Watson, gave the order in which they had placed the cattle in each ring and explained to the competitors and spectators the various points that had been taken into consideration in making their decisions.

The Challenge Cup and medals were presented to the successful team and individual competitors at the Annual Meeting of the National Federation of Young Farmers' Clubs on the afternoon of October 25.

Poultry Judging.—The fourth Annual Poultry Judging Competition for Young Farmers' Clubs was held at the Dairy Show on October 26, six teams competing for the Silver Challenge Cup presented by Dr. Bernard Bailey. The competitors were required to judge three rings, each of four birds, the breeds being Rhode Island Red, White Wyandotte, and White Leghorn.

NOTES FOR THE MONTH

The Cup was won by the Chiddingfold (Surrey) Club with a score of 725 points out of a maximum of 900. The final placings of teams and individual competitors were as follows:—

<i>Teams.</i>	<i>Points.</i> <i>(Max. 900).</i>	<i>Individual Competitors.</i>	<i>Points.</i> <i>(Max. 300).</i>
Chiddingfold	725	Frank S. Dean (Ringmer)	266
Croft	663	W. R. Thomas (Chidding-	
Boltons	653	fold)	248
Ringmer	642	Betty Thomas (do.)	241
Hunwick	528	Mary E. Burdon (Croft)	239
Sevenoaks Weald ..	480	Helen Carn (Chidding-	
		fold)	236
		Graham Bell (Boltons)	235

The judges were Capt. Ellis Duckworth and Mr. A. F. Tomey.

At the close of the contest Dr. Bailey presented the Cup to the successful team, and the medals given by the British Dairy Farmers' Association to the leading individual competitors.

Agricultural Machinery Testing Committee

THE undermentioned Certificate and Report, issued by the Ministry, have been published in pamphlet form (price 3d., post free, 3½d.):—

No. 49. Miller Seed Spacing Drill, submitted for test by the inventor, Mr. G. J. Miller, Chelsfield, Kent.

The test was carried out by the Institute for Research in Agricultural Engineering, University of Oxford, and the Norfolk Agricultural Station, Sprowston, Norwich.

Copies of the pamphlet may be obtained, at the prices stated, through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

Travelling Scholarship in Agriculture

THE Governors of the College of Estate Management offer a Travelling Scholarship to the value of £300, tenable for one year, for the purpose of studying agricultural methods in this country or abroad.

The Scholarship is open to British-born graduates of a British University, or those holding such qualifications as may be approved by the Board of Governors of the College. All applicants must be under thirty years of age on December 1, 1934.

Application forms are obtainable from the Secretary of the College, 35, Lincoln's Inn Fields, London, W.C.2, and must be lodged at the College not later than January 1, 1935.

MARSH SPOT IN PEA SEEDS

GEO. H. PETHYBRIDGE, B.Sc., PH.D.,
*Ministry of Agriculture Plant Pathological Laboratory,
Harpenden, Herts.*

FROM time to time, complaints are raised concerning a defect in pea seeds to which the name Marsh Spot has been given. The term appears to have originated from the fact that the trouble is most common in seeds from crops grown on low-lying marsh land, particularly that near the sea, as in such localities as Romney Marsh in Kent, Foulness Island in Essex and some parts of Lincolnshire. The defect itself is but rarely discernible in the seeds until they have been split; then it shows itself mainly in the form of a dark, often slightly sunken spot, of variable size, on the face of each seed-leaf (cotyledon), which marks the position of a nest or pocket of dead cells. The nature of this spot, or lesion, will be discussed in detail in a subsequent paragraph.

In England, opinions differ as to the economic importance of the defect. Seed merchants, on the whole, do not look upon it with great concern. On the other hand, some farmers, at least, who grow peas by contract for seed dealers, demand that the stock seed supplied to them shall be free from Marsh Spot; and the demand, it is understood, is usually satisfied. Complaints have not so far been raised by users of fresh green peas either for immediate culinary purposes or for canning; and this, it is thought, may perhaps be because at the early stage of ripeness at which the crop is gathered for these purposes the defect has not become pronounced, even if initiated at all.

The same defect occurs in pea seeds grown in certain parts of Holland, and, at times, would seem to be the cause of very considerable trouble there. It has also been recorded in France. In Holland, van Poeteren^{9*} has noted a similar trouble in brown beans, while Miss de Bruijn¹² states that French runner beans may also be affected.

As to the exact cause of Marsh Spot very little is yet known but it can be stated at once that the defect is not a disease of the seed, in the ordinary acceptation of that term, for the death of the tissues does not appear to result from attack on the seed by any pest, parasitic micro-organism or virus. Nor is it "seed-borne," in the sense that the trouble is likely to reappear in the succeeding crop;

* References will be found on page 849.

MARSH SPOT IN PEA SEEDS

for when seed affected with Marsh Spot is sown in ordinary good land, it generally produces as sound a crop of seeds as that obtained from unaffected seed.

Previous Literature on Marsh Spot.—With the exception of a brief note by J. Bryce,¹¹ published in 1931, practically nothing on Marsh Spot appears to have been published in this country. The object of the present article is to summarize what is known about it as a result of studies carried on partly in Holland, but also to a considerable extent at, and on behalf of, the Ministry's Plant Pathological Laboratory. Field studies on the problem were started in 1933, with headquarters at the South-Eastern Agricultural College, Wye, Kent, the primary object being to discover if possible whether any correlation exists between soil type or condition and the incidence of Marsh Spot in crops of peas. It is expected that the results of these studies will be published in due course by those who are engaged in the work.

It is extremely probable that the defect was known in this country nearly a century ago, for a correspondent sent to the *Gardeners' Chronicle* in 1845¹ some peas (bean-pea) which he thought were affected with a *new disease*. The seeds were "curiously affected with rot" (to be seen on splitting one open) "yet so fair in appearance that a dealer in Mark Lane would have bought them without suspicion." From this, and from the Editor's note on the specimens, it seems practically certain that the seeds were affected with what is now known as Marsh Spot. The publication of this note quickly prompted a reply from another correspondent,² through whose warehouse some thousands of quarters of peas were constantly passing. He stated that he had very strong reason for suspecting that the supposed "new" disease was considerably older than the times of the first correspondent's great-grandfather. It was one, he said, that could be found every year in some peas, and the complaint would be recognized by most farmers if the peas were described as being "pigeon-eyed." It was to be found in most years in peas grown near or on marsh land, but perhaps the wetness of the season had led to an increase of the trouble in 1845. He added that any one who could find a remedy for the trouble would confer an obligation on many a farmer and seedsman; but if draining the land thoroughly would not prevent it, appeal must be made to the Pleiades.

MARSH SPOT IN PEA SEEDS

No further information concerning this pea defect has so far been found emanating from English writers, but a considerable amount has been secured from a scrutiny of Dutch publications. In Holland, Marsh Spot appears to be well known under the names "kwaad hart" (bad heart), "kwade pitten" (bad cores) and "zwarte pitten" (black cores). J. Ritzema Bos⁵ reported in 1913 on the occurrence in 1911 of pea seeds affected with "kwaad hart" from Rilland and from various places in North Holland. In the attacked tissues he could not find fungus mycelium, although he saw bacteria. These, he concluded, could not have entered the seed by way of the vascular tissue, but must in some way have come from the exterior. He had no time to test experimentally whether they were the cause of the trouble, but he surmised that external conditions had more to do with it than bacteria. Two years later, H. M. Quanjer, then assistant to Ritzema Bos, returned to the subject.⁷ The bad peas, concerning which complaints were then prevalent in various districts, were internally brown and hard. On cooking, the core remained hard whilst the remainder boiled to pieces. He noted that the browning was not always confined to the seed-leaves (cotyledons), but sometimes affected the young shoot (plumule). Most of the affected peas germinated quite normally, but when the plumule was discoloured, branching of the seedling occurred early. Later, the plants grew on normally. His inquiries showed that the trouble had been known in Holland since, at least, 1894. Affected seeds sown in a humus-rich, sandy soil, manured with cow dung and patent-potash, produced healthy plants and sound peas. Neither fungi nor bacteria could be discovered by microscopical examination of the dead cores, but it was recognized that micro-biological culture work on the matter was required to settle the point satisfactorily.

In 1918, a longer paper on the subject was published by H. A. A. van der Lek.⁸ It was pointed out that but little was really known about the trouble, and an appeal was made for the co-operation of farmers in an endeavour to learn more about it. This author's observations confirmed those of Quanjer as far as they went, but he went further and endeavoured, by cultural means, to isolate a micro-organism from the dead tissue in the seed. His results, however, were negative. He observed that when the plumule in the seed was affected, the resulting seedling

MARSH SPOT IN PEA SEEDS

might have no main shoot; but the want of this was made good by the early development of one or two lateral shoots. Plants raised from "bad-cored" seeds yielded sound seeds, so that the abnormality could not be regarded as hereditary. The trouble appeared to be restricted to crops grown in polder land (reclaimed from the sea), and it was thought that possibly sea salt might have something to do with it. However, even in a field, lying level behind a sea dyke, which had carried a crop yielding defective seeds, and into which sea water was said to penetrate at high tide, only mere traces of chlorine were found on chemical analysis. It was suggested that some still unknown soil factors, or perhaps unfavourable weather conditions at the time of harvest, might be of importance; but these were merely conjectures, and further investigation was required before the mode of origin of the trouble could be determined and possible control measures suggested.

In 1919, Ritzema Bos⁶ mentioned that complaints of the trouble had occurred again in 1915, and he gave a brief description of it, but without adding anything essentially new.

The latest and most extensive work on the subject is that published in 1933 by Miss H. de Bruijn,¹² who carried on elaborate experiments for five years in the heavy clay soil of the grounds of the Laboratory for Mycology in Wageningen. The nature or condition of the sub-soil is not stated. The defect was most marked in the heaviest seeds, and it appeared in the pea crops grown there, an inland locality, but not so intensively as in some other districts; it is not therefore confined to polder land. It is said to be known in the islands of south Holland and to occur on the polder lands in the north of France, where the affected peas are described as "moucheté" (spotted). Neither parasitic fungi nor bacteria could be made responsible for the trouble; nor was it thought likely that it could be due to a virus. The conclusion arrived at was that it must be a disease of the "physiological" type—a conclusion which, it was considered, was supported by the results of a comprehensive series of manurial experiments. With nitrogenous manures the results were contradictory, but the largest percentages of substantially defective peas were obtained when a complete fertilizer, or one containing potash as well as nitrogen, was applied. When potash was supplied alone, the number of such seeds was reduced; but

MARSH SPOT IN PEA SEEDS

the trouble was not believed to be due simply to potash deficiency. It was considered that Marsh Spot began to set in during the maturation period, and that the more protracted this period, the greater was the number of substantially affected seeds that appeared in the produce. Anything that could be done to accelerate maturing might be expected to diminish the trouble.

In spite of the evident amount of care and labour devoted by Miss de Bruijn to these protracted investigations of a difficult problem, yet it must be confessed that they do not seem to clear up the situation fully, as, indeed, Miss de Bruijn herself admits; and it is clear that the actual cause of Marsh Spot has still to be discovered. It may possibly be that the physical nature of the soil and its water relations, rather than its chemical condition as a result of manuring, are of prime importance. Nor is it perhaps superfluous to suggest that although the over-ground parts of the plants (apart from the seeds themselves) show no abnormal symptoms, yet some attention might well be devoted to the roots of pea plants that produce seeds affected with Marsh Spot. Miss de Bruijn herself has suggested that degree of root-nodule development might perhaps be of importance, but she was not able to follow this matter up. It is conceivable that some effect on the roots by parasitic or by some other agency might be correlated with the occurrence of Marsh Spot in the seed; and some study of the root systems of pea plants that are producing affected seeds would be well worth while.

Before concluding this brief summary of the previous literature reference must be made to another disease that occasionally affects pea seeds and pea plants, because it has apparently sometimes been confused with Marsh Spot.* In 1913, Miss D. M. Cayley⁸ published a preliminary note on a new bacterial disease of the culinary pea, and this was followed in 1917⁴ by a more complete account. Although some of the symptoms described recall those of Marsh Spot, yet there are essential differences between the two troubles, to which, indeed, Miss de Bruijn has already called attention. The new disease was proved to be due to a bacterium, to which the name *Pseudomonas seminum* was given; but it was, of course, not referred to as Marsh Spot. It is possible, however, that some of the material studied

* For instance, in a note headed "Pea Crop Disease Menace" in *The Fruit Grower*, 60, 1925, p. 774.

MARSH SPOT IN PEA SEEDS

by Miss Cayley may have been affected with Marsh Spot as well as attacked by the new bacterial disease.

Symptoms of Marsh Spot.—As far as is known, the fact that a pea plant will bear seeds affected with Marsh Spot cannot be discerned from any unusual symptom shown by the overground parts of the plant itself; whether the roots of such a plant show any abnormality or not has, as already indicated, yet to be determined. All the seeds from such a plant do not usually show the defect, whilst normal and defective seeds may even be found side by side in one and the same pod. Usually the seed shows no external sign of the trouble within, although occasionally one may find a seed showing a brown mark through the skin on each side, due to Marsh Spot. That illustrated in the bottom right-hand corner of Fig. 1, for example, showed such spots externally. It must be remembered, however, that spots on pea seeds may be due to other causes, such as attack by the fungus *Ascochyta*; and these lesions must not be mistaken for Marsh Spot. If a dry pea seed affected with Marsh Spot is split open, the centre of each half will show a rusty-red or brownish spot. The size of the spot varies in different seeds, and sometimes the discoloration is more or less confined to its margin, leaving a whitish centre. The spot is best seen if the cut is made in a line with the scar (hilum) that indicates the place at which the seed was attached to its short stalk in the pod. The two seed-leaves (cotyledons) are thus separated, and the spot will be seen on the flattened surface of each, sometimes taking the form of a shallow pit. In some instances, it will be seen that the tip of the very young shoot (plumule) is also affected.

The best way to study the Marsh Spot lesion, however, is to soak the peas for 24 hours or longer in water, until they are plump and soft. With care the skin can then readily be removed without injury to the embryo which fills it. The latter, as is well known, consists of two hemispherical lobes, the seed-leaves (cotyledons), to which are attached the small conical radicle (which becomes the main root) and the still smaller plumule, which becomes the shoot. The last-named is visible only when the two cotyledons are prised apart. It lies between their flattened inner faces, and at right angles to the direction of the radicle. Soaked pea seeds affected with Marsh Spot show, when the cotyledons are separated, a more or less dark reddish brown to

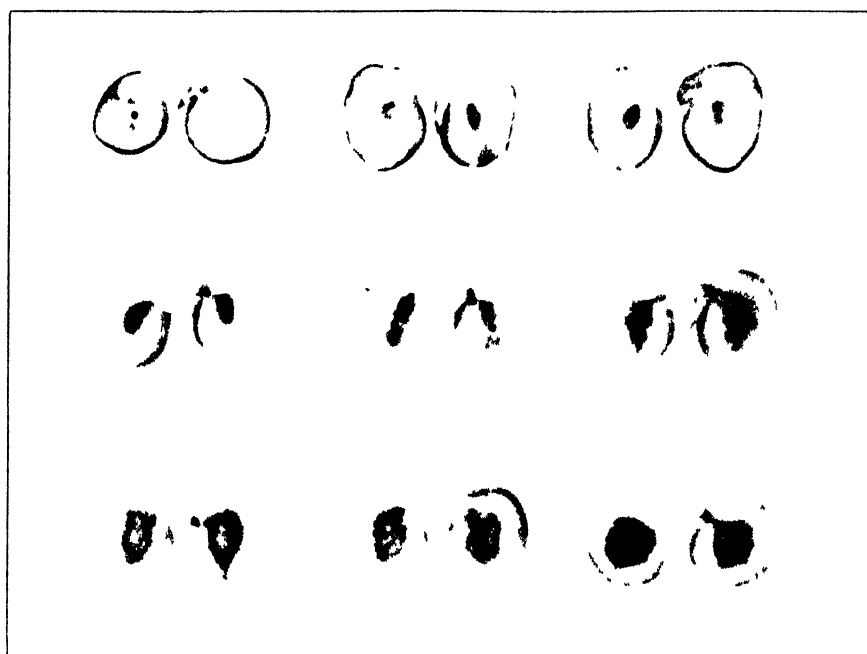


FIG. 1.—Pericarps removed from seedlings of *Elymus canadensis* showing various degrees of Marsh Spot.

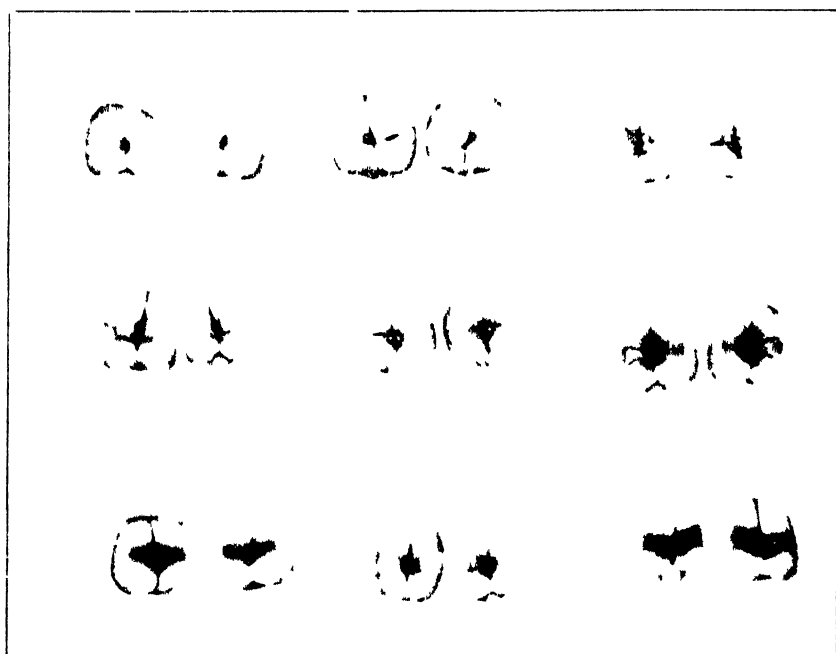


FIG. 2.—Soaked pericarps cut across at right angles—the radicles showing Marsh Spot lesions of varying sizes.

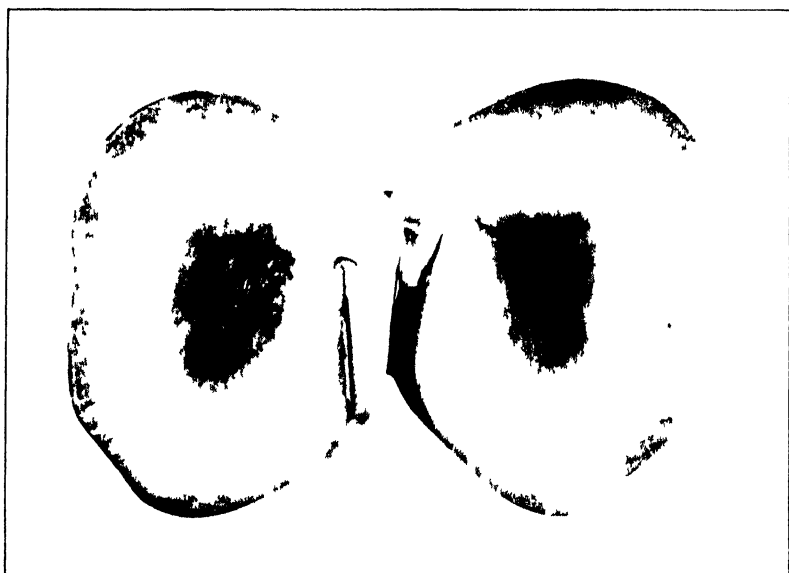


FIG. 3. A pea embryo (enlarged) with cotyledons separated showing Marsh Spot in them but the plumule not visibly affected.

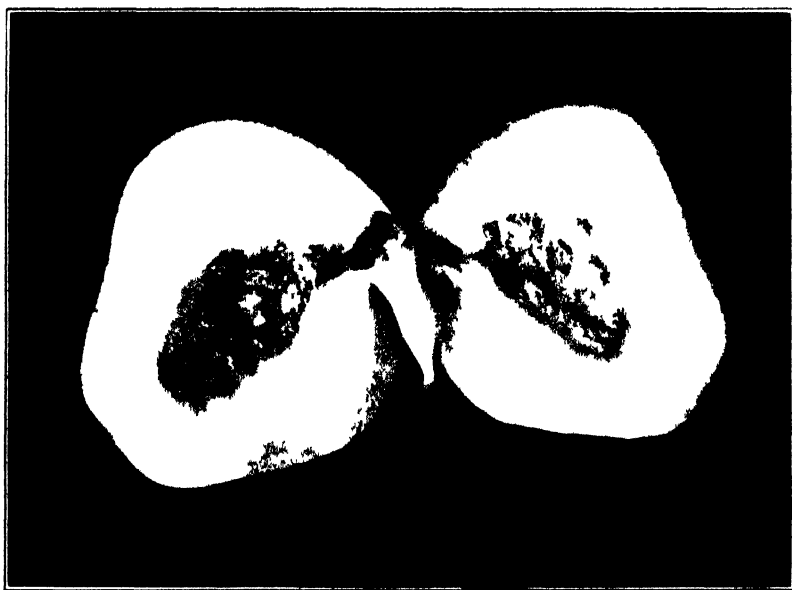


FIG. 4. A pea embryo (enlarged) with cotyledons separated showing lesions in the cotyledons and also a thickened plumule.



FIG. 5 - Two lots of seedling pea from seed affected with Marsh Spot. In A lesions in the cotyledons only, in B, lesions in the plumule as well.

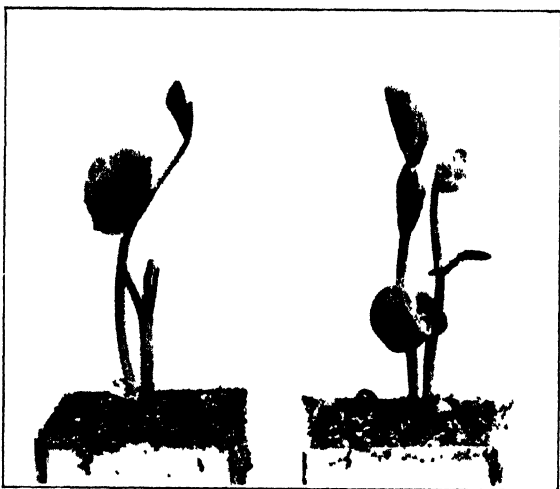


FIG. 6. Two defective pea seedlings derived from seed infected with Marsh Spot in the cotyledons only.

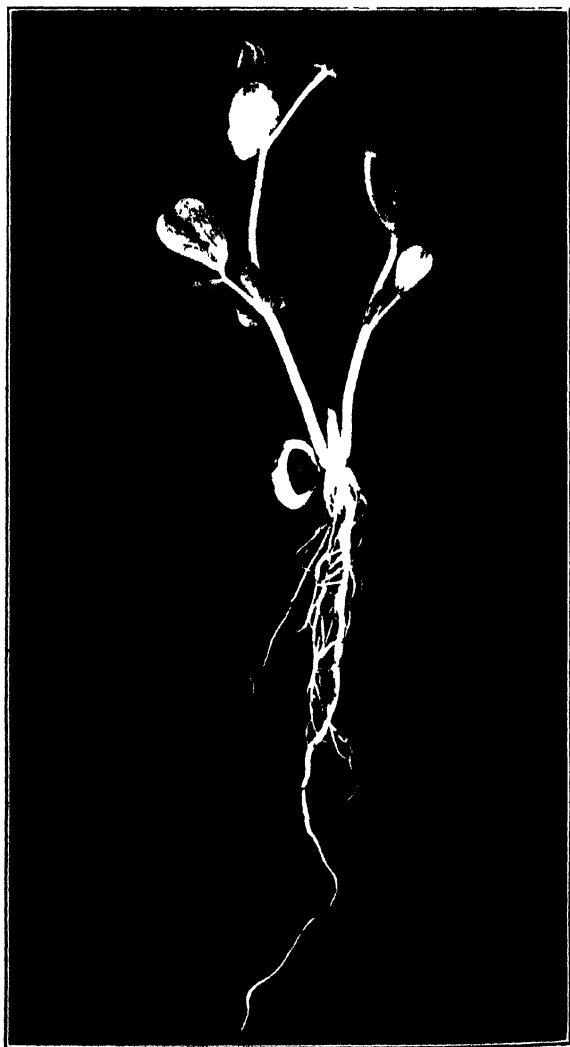


FIG. 7. A pea seedling from a seed infected with Marsh Spot in cotyledons and plumule. The leading shoot has aborted, but two unequal laterals have developed from buds in the axils of the cotyledons. The right hand cotyledon has broken off; the other shows a conspicuous lesion.

MARSH SPOT IN PEA SEEDS

an almost black spot on the inner flat face of each cotyledon. Peas of this kind that have had their skins removed and the cotyledons of the embryo gently forced apart are illustrated in Fig. 1, which represents a series, starting at the left-hand top corner with slight or moderate attack and progressing to severe attack in the right-hand bottom corner. The spots vary in size, but they never extend over the whole inner face of the cotyledon. They differ also in depth of colour, but the two spots in the paired cotyledons of any one seed are usually of much the same density as well as size and appearance. This, however, is not always so; moreover, when the defect is slight, a small spot may occur in one cotyledon but none in the other. The discoloration of the spot is not always uniformly dense over its whole area, hence the spot itself may appear punctate or even blotchy. Sometimes the spot is surrounded by a kind of halo, and this was quite evident in the last embryo on the right in the bottom row of Fig. 1, but is not well shown in the photograph.

Occasionally, owing to shrinkage of the dead cells, a cavity arises below the spot, and the skin of the cotyledon may remain stretched taut over it, like that of a drum; or, the stretched skin may split and the cavity become more or less evident. This condition is illustrated in the left-hand cotyledon of the embryo just alluded to in Fig. 1. On the other hand, the skin may remain firmly attached to the contracting dead tissue, and thus the spot itself becomes a shallow, discoloured pit. Most frequently the plumule remains unaffected, as is well shown in Fig. 3; but sometimes it is also brown and dead, as is illustrated in Fig. 4, or at least partially so. From seeds of this kind mutilated seedlings arise, as will be described later. In rare instances the plumule alone is affected.

When affected seeds are cut across in a plane at right angles to that of the flat surfaces of the cotyledons, appearances such as are shown in Fig. 2 are seen. The central parts of the flat surfaces of the two cotyledons are not in close contact, and thus there is a lenticular cavity between them. The spot visible on the flat surface of a cotyledon is now recognized as being the surface view of a more or less rounded, cylindrical or conical mass or nest of dead, brown, tissue, in which there may often be one or more slit-like cavities, more or less at right angles to the plane of the upper surfaces of the cotyledons. Death of the central

MARSH SPOT IN PEA SEEDS

mass of cells has proceeded in one example (bottom right-hand corner) through practically the whole thickness of the cotyledons, and this is the seed already alluded to above in which Marsh Spot could be detected from external inspection. In most cases, however, the discoloured tissue does not extend so far. Its margin, as seen on the surface of the flat side of the cotyledon (Fig. 1), usually runs very roughly parallel to the periphery of the cotyledon, but this is seldom fully reached at any point, except perhaps close to the plumule.

Microscopical examination of one of the spots shows that its margin may be regular or irregular, and that the dead area is fairly well marked off from the unaffected tissue, but seldom really sharply. Sections through the tissues show that the normal healthy cells are full of starch grains, but there are few or none of these grains in the dead tissue. The cells of this have brown, granular, disorganized contents, while somewhat similar material may be seen in the intercellular spaces, together with some amount of a clear, brown, gum-like deposit. The cell walls are sometimes disorganized, but in the main they are not markedly so, and they are not deeply discoloured. Fungal hyphae are conspicuous by their absence, and bacteria are not discernible with any degree of certainty. The dead mass of cells is not shut off from the surrounding healthy tissue by a layer of cork cells.

Search for a Possible Pathogen.—That the dead tissue in seeds affected with Marsh Spot seldom or never contains fungus mycelium has been proved by microscopical examination of unstained sections as well as of others stained by one or more of the methods peculiarly adapted for disclosing the presence of fungus hyphae in host tissue. There is therefore no reason to suspect the presence of a fungus in the seed as being the cause of Marsh Spot. The certain detection of bacteria in such tissue by such means is a much more difficult matter, but efforts to discover their habitual presence have not met with success. Quanjer, as already stated, at first conjectured that bacteria might be involved, and so did van der Lek, who endeavoured to isolate them, but without success. Miss de Bruijn paid considerable attention to this matter, particularly in view of the possibility that Miss Cayley's *Pseudomonas seminum* might be the cause of Marsh Spot. From whole peas, both healthy

MARSH SPOT IN PEA SEEDS

and affected with Marsh Spot, she obtained bacteria without difficulty, as was to be expected; but it was proved that they did not come from within the pea tissue itself. From the majority of the lesions in fresh peas affected with Marsh Spot neither bacteria nor fungi could be isolated, hence this investigator concluded that the defect could not be due to an organism.

In order to settle once for all, if possible, the question as to whether bacteria were or were not concerned with Marsh Spot, an extensive series of investigations was carried out during the years 1928 to 1932 by Miss M. Lacey* under the direction of Professor S. G. Paine, whose services have been retained by the Ministry's Plant Pathological Laboratory for some time for special bacteriological investigations. In all, 400 attempted isolations were undertaken, half of which were concerned with dry ripe seeds affected with Marsh Spot, whilst the other half were made with affected seeds taken fresh from the pod. Different varieties of peas were included, and they came from different sources, one being from California. Both liquid and solid culture media were employed, and wide ranges of hydrogen-ion concentration were tried. In roughly seventy per cent. of the trials, no growth whatever occurred when portions of the Marsh Spot lesions were transferred aseptically to suitable nutrient media. With lesions from fresh seeds, the highest percentage of sterility was 100, and the lowest 56; with dry seeds these percentages were 78 and 30 respectively.

The growths obtained from the non-sterile lesions were variable both in amount and character. Frequently, in plate cultures, only one or two colonies appeared. Similarly in broth cultures, the slow development of turbidity indicated that the material introduced must have contained very few organisms. The organisms isolated could be arranged in six groups, viz. (1) spore-forming bacteria of the *B. mesentericus* and *B. subtilis* types, (2) a minute yellow rod (probably *B. herbicola aureum*, commonly found on the exterior of seeds), (3) Sarcinae, Torulae and Cocci, (4) mixed growths of (1)-(3), (5) bacteria of various types not included in (1)-(3), such as *B. fluorescens*, etc., and (6) fungi. Some of the most predominating types were also obtained from pea seeds free from Marsh Spot. When it is remembered that one of the easiest ways to obtain a

* A full account of Miss Lacey's work has now been published in the *Annals of Applied Biology*, 1934, 21, p. 621.

MARSH SPOT IN PEA SEEDS

mixed bacterial culture for teaching or demonstration purposes is to incubate a pea seed for a short time in a small quantity of sterile water, it will not be regarded as surprising that a certain proportion of the lesions in seeds affected with Marsh Spot did not prove to be sterile, but yielded a mixed micro-flora.

Had a pathogenic organism been present this would have been expected at least to predominate (especially in the fresh seeds) over everything else, even if it did not occur alone. Moreover, it is most unlikely that an average of 78 per cent. of the lesions in the fresh seeds would have proved to be sterile (as was found to be the case) if they had been caused by any organism. The results, indeed, point entirely against the view that bacteria are concerned in the production of Marsh Spot. They are, moreover, most strongly re-inforced by evidence obtained from inoculation experiments. Cultures of all the types isolated were inoculated into young seedling peas and into pods in varying stages of development, but invariably with negative results. All the evidence obtained, therefore, was in favour of the view that the Marsh Spot lesions are not due to any parasitic micro-organism.

Germination of Seeds affected with Marsh Spot.—Although pea seed growers, as already mentioned, and also seed merchants are interested in the problem of Marsh Spot, and particularly so from the point of view of its influence, if any, on the percentage of germination of affected seed as compared with that of normal seed, yet information on this point appears to be very scanty in publications coming from official Seed Testing Stations. Probably this may be taken to indicate that Marsh Spot is of little significance in this respect, and yet in Holland, at least, pea-growers definitely do not like such seed, and when obliged to sow it do so at a higher rate than usual. According to Miss de Bruijn, real loss occurs only when the percentage of defective seeds is rather high, say 20 per cent. and over, and she gives figures showing the percentage number of samples of pea seeds containing more than 20 per cent. of Marsh Spot received each year at the Dutch Official Seed Testing Station during the decade 1923-32. Except in the years 1923 and 1926, when the percentages were 10 and 12 respectively, the figure was never more than 7 per cent.; and the average for the remaining eight years was 3.5 per cent.

MARSH SPOT IN PEA SEEDS

In a paper dealing with investigations on the state of health of seeds, published in 1930, Miss L. C. Doyer¹⁰ of the Dutch Official Seed Testing Station refers to Marsh Spot ("schwarze Kerne") in pea seeds as an abnormality, and indicates the best way of detecting its presence during the germination test. The depreciation in value of the sample is said to depend on the size of the lesions in the seeds. Miss Lacey found that seeds in which the two cotyledons were both very severely damaged and the tip of the plumule occasionally browned, generally failed to germinate.

In No. 6 of the Seed Analysts' Bulletin, 1926, circulated by the Official Seed Testing Station at Cambridge, attention was called to the occurrence of Marsh Spot in pea seeds, and it was stated that in very bad cases little or no germination of affected seeds may take place. Mr. A. Eastham, Director of the Station, has been good enough to supply some further information on the matter from the unpublished observations and records of the Cambridge Station made by Mr. C. E. Brett. A careful scrutiny of 200 samples of pea seeds made in 1925-26 showed 45 per cent. affected with Marsh Spot, and of this percentage 11.5 showed over 20 per cent. of affected seeds. In 1927-28 about 25 seeds from each of 900 samples were examined during the germination test, and about 11 per cent. were found to be substantially affected. The general impression gathered over a period of years was that the defect is more prevalent in some seasons than in others. In very few instances is the percentage of germination of the seed, as determined in the laboratory, affected to any appreciable extent by the presence of Marsh Spot. Even heavily affected samples have given high percentages of germination, and slightly affected samples have been associated with poor germination, but with no indication that Marsh Spot was responsible for it. The characteristics and extent of the individual lesions probably have more influence on germination than the number of affected seeds.

No extended series of germination tests has been carried out at the Ministry's Plant Pathological Laboratory, but in the experiments undertaken there, to which reference will be made in subsequent paragraphs, it was found that when samples containing affected seeds were set to germinate there was no significant difference in germination per cent. between the affected seeds and the normal ones in the same sample.

MARSH SPOT IN PEA SEEDS

Effect of Marsh Spot on the Seedling.—Provided, of course, that they are viable, seeds affected with Marsh Spot, unless very severely damaged, will germinate and produce seedlings. Such seedlings may appear quite normal or at most slightly undersized, or, more commonly, they may be defective in some of their parts. These defects are generally most marked in seedlings from seeds in which both the plumule and the cotyledons are affected; but even when the lesions appear to be confined to the cotyledons, the plumule not being visibly affected, the main shoot of the seedling may be mutilated.

In Fig. 5 two boxes of pea seedlings, grown at the Plant Pathological Laboratory in 1931, are shown, the particulars concerning which are as follows:—The seed was from a 1930 crop of the variety Alderman, and was kindly supplied by Mr. A. E. Newby, of Messrs. Hurst & Son, who has at various times assisted the work in this and other ways. It was affected with Marsh Spot to the extent of about 75 per cent. The parent (1929) crop of the same strain of seed had shown no Marsh Spot. A considerable number of seeds were soaked in water for 48 hours, their skins were then carefully removed and the cotyledons gently prised apart in order to determine whether Marsh Spot was present or not, and if so whether the cotyledons alone or the plumule also showed brown lesions. In this process the embryos were not damaged in any way. Forty-eight seeds with no visible sign of Marsh Spot (A) were then selected, and a similar number (B) showing the defect. Of the latter, 32 showed it in the cotyledons alone, (Bb) and the remaining 16 in both plumule and cotyledons (Bc). The embryos remained for a few days on damp filter paper in a covered dish, during which period all the radicles elongated considerably. Each embryo was then placed in a separate carton of soil (such as is now commonly used for raising sweet peas), and the two lots, of 48 cartons each, were assembled in their boxes, the (A) lot in the right-hand box in the figure and the (B) lot in the left. The boxes were placed in an unheated greenhouse on May 18.

After 14 days, when the boxes were photographed, 46 seedlings had arisen in (A); 21 of them were more vigorous than the rest and were not defective in their parts; 16 were rather backward and showed some distortion of the leaflets and stipules, whilst the remaining 9 were strikingly abnormal and resembled seedlings in the other box (B) from

MARSH SPOT IN PEA SEEDS

seeds in which Marsh Spot was visibly present. Two of them showing the most marked abnormalities, are illustrated in Fig. 6. This result was rather surprising, for it was expected that only those seeds that possessed readily visible brown lesions would produce imperfect seedlings. When examining seeds from samples affected with Marsh Spot, however, it has been noted that the central portions of the cotyledons in some cases appeared to be a little denser than the surrounding tissue, although there is no sign of discoloration. This condition may perhaps correspond to the "hard-core" of Dutch writers, and it is possible that such seeds may produce defective seedlings. The matter requires further study, but it may be mentioned that Mr. Brett has found that the percentage of seeds visibly affected with Marsh Spot in their cotyledons is nearly always greater when determined by the examination of seedlings from an affected sample about 12-14 days after sowing than when determined from the dry or the soaked seed of the same sample before sowing. The discrepancy has always been largest in samples showing, when soaked, a relatively small number of affected seeds.

As will be seen from the illustration, the seedlings in lot (B) (left-hand box), of which there were only 42 altogether, were for the most part much inferior to those in (A). Of the (Bb) (cotyledonary lesions only) set, six were practically as good as the best of (A), whilst the remainder resembled the nine worst of (A). The most imperfect seedlings came from the (Bc) (cotyledonary and plumular lesions) lot. In these, complete leaflets were sometimes suppressed, or the entire leaf was reduced to a small stub and a pair of ragged stipules. Many leaflets, instead of being flat, had wrinkled margins and a puckered appearance, especially near the terminal notch. Often they were "hooded," apparently as the result of early injury to the indented tip. In many cases the terminal bud of the main shoot had been destroyed, and two, generally unequal, shoots had in consequence developed from the buds in the axils of the cotyledons. An instance of this kind is illustrated in Fig. 7. The vigorous lateral shoots developed here, however, would suggest that ample compensation for the loss of the leading shoot had been provided.

All the seedlings in the two boxes illustrated were transplanted to the open ground on June 2. The weather remained favourable and only a few of them subsequently

MARSH SPOT IN PEA SEEDS

succumbed; the rest flowered and fruited, and the characteristics of the seeds produced will be discussed in a subsequent paragraph.

Incidentally, many of the plants showed Mosaic during the season; some early, probably seed transmitted, and some considerably later, probably due to secondary insect transmission. There was, however, no correlation whatever between the incidence of Mosaic and that of Marsh Spot in the seeds sown.

From what has been said it will be clear that whilst Marsh Spot may not have much influence on the actual percentage of germination of affected seed, yet a considerable number of the seedlings arising from seed suffering from this defect may be more or less seriously mutilated and thus handicapped in their early struggle for existence. If weather and soil conditions are favourable to the seedlings, many or most of them may perhaps overcome this initial check, and a more or less normal crop may result. If, on the other hand, soil or weather conditions are unfavourable, it would seem certain that the extra handicap thus imposed would lead to an inferior or perhaps even a worthless crop. It can scarcely be doubted, therefore, that there must be a very definite risk attached to the sowing of such seed, and it is not surprising to find that some farmers, at least, are reluctant to incur it.

Is Marsh Spot a Seed-transmitted Defect? —A preliminary experiment designed to afford an answer to this question was carried out with the assistance of Mr. F. E. V. Smith at the Ministry's Plant Pathological Laboratory in 1926. From parcels of pea seeds of nine different varieties affected with Marsh Spot to a substantial degree, but not quantitatively determined, lots of twenty-four each were sown on May 3 in the open in a heavy clay soil lying on chalk. One of the resulting crops was harvested on August 24 and the remainder on September 9. From the 150 or so plants that were harvested a considerable amount of seed was obtained, but the exact number of seeds produced was not determined. Every seed was cut and examined for Marsh Spot, but the defect was found in only thirteen of them. Four of these were of the variety Benefactor, five of Alderman and four of a variety known by a number only. Such figures certainly do not suggest seed-transmission, at all events on any considerable scale.

MARSH SPOT IN PEA SEEDS

A further experiment was carried out in 1931 as an extension of the observations on germination and seedling development already described, in all of which Dr. A. Smith rendered valuable assistance. The crop from each plant that had been set out in the open ground on June 2, as already mentioned, was harvested separately on September 8, the pods being placed in perforated paper bags that were then hung up to dry in a shed for about 10 days. During this period the atmosphere was somewhat humid, and at the end of it, when the pods were shelled, there was a certain amount of mouldiness in some of the bags, whilst some slight damage due to pea moth larvæ was also encountered. The seeds were then placed in fresh perforated bags, exposed for a time in a sunny window to facilitate further drying, and kept until April, 1932, in an unheated room in the laboratory. When examined towards the end of that month it was found that seeds affected with Marsh Spot had been produced by two plants only, four by one plant and three by the other. These plants arose from seeds that showed lesions in their plumules as well as in their cotyledons, but neither of them was affected with Mosaic. The lesions in each of these seven seeds were very small and they were confined to the cotyledons. These seven seeds were the only ones out of a total of over three thousand examined that showed any trace of Marsh Spot, and the experiment certainly does not suggest that the defect is transmitted through the seed from one generation to the next.

In his experiments on Marsh Spot, van der Lek paid special attention to the question of seed-transmission. Of about 150 very young seedlings, each of which was definitely ascertained to have been derived from an affected seed, he planted half in sandy and half in clay soil. The plants developed normally, and in the progeny there was not a single affected seed. He therefore concluded that the abnormality was not hereditary. He also stated that this result was in agreement with practical experience in the field. A trial carried out by Mr. Brett at the Cambridge Seed Testing Station in 1927, showed that with two known varieties affected with Marsh Spot to the extent of 85 per cent. and 68 per cent. respectively, the resulting crops showed only 1 per cent. in the first variety and none in the second. On the other hand, a third (unknown) variety, the seed of which was affected to the extent of 88 per cent. grown side by side with the other two, gave a crop contain-

MARSH SPOT IN PEA SEEDS

ing 25 per cent. of affected seeds, an unexpected result and possibly a varietal one. In 1931 Miss de Bruijn sowed a quantity of seeds, affected to the extent of 90 per cent. under the same conditions as a smaller quantity containing at most a small percentage of affected ones. The yield of both lots was similar, but the percentage of seeds affected with Marsh Spot was greater from the lot originally almost free from it. Experiments carried out by Miss Lacey in 1928, 1929 and 1931 produced very little evidence of any seed-transmission of the defect, and in several cases there was as much Marsh Spot in the progeny of seed free from the defect as in that from affected seed. The evidence for seed transmission of Marsh Spot is therefore very slender, and it is more than likely that when the defect occurs in seed from plants arising from affected seeds the reason is to be sought for not in the condition of the seed sown but in some as yet not fully discerned soil factor.

Summary and Conclusions.—As far as our present knowledge goes it can be stated that Marsh Spot is a defect of the seed characterized by the death of larger or smaller portions of the tissues of the cotyledons, and sometimes of the plumule, of the embryo pea plant. There is no evidence that the death of these tissues is due to local infection or to attack on the aerial parts of the plant by any pathogenic micro-organism. Whether the lesions may possibly be a concomitant of parasitic attack on the roots of the plant has not yet been investigated, but the facts already known would seem to suggest that they are the result of unfavourable soil conditions, especially excess of water and the physiological disturbances that follow from this.

The exact time at which the lesions begin to arise in the developing seed is not yet known with certainty, but it would appear that they are not present in the very young seed and become most pronounced during the later stages of ripening.

The effect of Marsh Spot on the percentage of germination of affected seed is practically negligible except in rare instances when the lesions are peculiarly large. Seedlings arising from affected seed are, however, generally defective to a greater or less degree and are thus handicapped at the outset of their career. Under favourable circumstances this check may be of no very great practical importance, and

MARSH SPOT IN PEA SEEDS

to compensate for it to a certain extent, a larger quantity of seed may be sown at the outset.

Marsh Spot is not believed to be a seed-transmitted defect; but when it occurs it is strongly suspected, though not yet specifically proved, that it arises afresh as a result of unfavourable soil conditions, whether the seed sown showed the defect or not. What exactly these conditions are, and whether it will be possible so to control them as to prevent the occurrence of the defect must remain to be discovered by further experimental investigation.

REFERENCES

- ¹ R. B. New Disease in Peas. *Gard. Chron.* 1845, 5, p. 658.
- ² A. G. Disease in Peas. *ib.* p. 689.
- ³ Cayley, D. M. A preliminary note on a new bacterial disease of *Pisum sativum*. *Proc. Roy. Soc. B.* 1913, 86, p. 171.
- ⁴ ——— Bacterial disease of *Pisum sativum*. *Jour. Agric. Science.* 1917, 8, p. 461.
- ⁵ Bos, J. Ritzema. Verslag over onderzoekingen, gedaan in en over inlichtingen, . . . in het jaar 1911. *Meded. v.d. R. Hoogere Land-Tuin- en Boschbouwschool, Wageningen.* 1913, 6, p. 159.
- ⁶ ——— Verslag . . . in het jaar 1915. *ib.* 1919, 16, p. 111.
- ⁷ Quanjer, H. M. Kwade pitten in de erwten. *Zeeuwsch. Landbouwbl.* 1915, 7, No. 250.
- ⁸ Lek, H. A. A. van der. Over de zoogenaamde "kwade harten" of "zwarte pitten" der erwten. *Tijds. Plantenziek.* 1918, 24, p. 102.
- ⁹ Poeteren, N. van. Verslag over de werkzaamheden van den plantenziektenkundigen dienst in het jaar 1925. Vers. e. Meded. *Plantenz. Dienst Wageningen.* 1926, 44, p. 17.
- ¹⁰ Doyer, L. C. Untersuchungen über den Gesundheitszustand des Saatguts. *Proc. Internat. Seed Test. Assocn.* 1930, 13/14, p. 10.
- ¹¹ Bryce, J. Marsh Spot disease of peas. *Essex Farmers' Journ.* 1931, 10, p. 71.
- ¹² Bruijn, H. L. G. de. Kwade harten van de erwten (with a summary: Marsh Spot of peas). *Tijds. Plantenziek.* 1933, 39, p. 281.

THE IMPORTANCE OF ATTRACTIVE LABELS

AN exhibition of labels and designs for National Mark labels was staged by the Ministry at the recent Imperial Fruit Show, held at Granby Halls, Leicester. It was hoped that the exhibition—the first of its kind—would evoke constructive criticism and stimulate producers and distributors to give serious thought to the value of well-designed and attractive labels as a selling factor.

It is generally conceded that the exhibition achieved the object of focussing attention on a subject that so far has not received the consideration that it merits: the need of attractive labels.

The exhibition was the outcome of collaboration between the Ministry of Agriculture and the Council for Art and Industry, which was appointed by the President of the Board of Trade in January of this year. The Ministry had received numerous requests for advice on the subject of labels for private brands, and it invited the assistance of the Council on this point and also on that of its own National Mark labels. A special sub-committee was appointed and recommended the Ministry, in the first instance, to commission certain artists of repute to execute designs for various National Mark labels, including private brand labels incorporating the Mark. The labels were to be suitable for a fairly wide range of containers: 40-lb. apple box, single-layer apple tray, 12-lb. tomato box, cucumber box (non-returnable), chip cover for soft fruits, cans and bottles of fruit and vegetables, a cider bottle and a honey jar. In addition, there were smaller labels, namely, tie-on and stick-on labels for vegetable crates, and a disc fruit label for use with a packer's own label.

Two commercial art studios and six individual artists were nominated by the sub-committee and were commissioned to execute at least two designs each. While they were experienced in commercial work, it appeared that most of them were unaccustomed to designing labels for food containers. It was felt, however, that artists who had achieved a reputation in one or more fields might conceivably produce new and distinctive designs for the Ministry's labels and incidentally set a high general standard.

IMPORTANCE OF ATTRACTIVE LABELS

Nineteen designs of various kinds were submitted by these commissioned artists. Two of them were considered unsuitable for the purpose for which they were intended. Most of the others needed amendment along lines suggested by the sub-committee of the Council for Art and Industry, and eventually seventeen designs of varying merit—nine for the Ministry's own labels and eight for private brand labels—were displayed in the exhibition at Leicester.

From the views expressed by visitors to the Imperial Fruit Show, it may be said that, whatever their shortcomings in minor matters of detail, the following four designs, of which illustrations are reproduced herewith, were generally regarded as the most effective:—

Ministry's Own Labels.

- | | |
|--|---|
| No. 1. Label for 40-lb. Apple Box | Clement Dane Studio Ltd.,
190, Strand,
London, W.C.2. |
| No. 2. Label for Cucumber Box (non-returnable) | R. P. Gossop,
2, Henrietta Street,
Strand, W.C.2. |

Private Brand Labels (incorporating the National Mark).

- | | |
|---|--|
| No. 3. Stick-on Label for Vegetable Crate (Cabbage Lettuce) | Margaret Calkin-James,
39, South Grove,
Highgate Village, N.6. |
| No. 4. Label for No. 2 Can for Fresh Picked Peas. | Fred C. Herrick,
15, Chatham Place,
Brighton. |

It may be noted here that the commissioned artists, as well as those who entered for the competition mentioned later, were allowed a certain amount of latitude in their interpretation of the National Mark. Nobody succeeded, however, in producing a design that was regarded as an improvement on the existing Mark.

The sub-committee also recommended that a public competition should be held for designs for labels for fresh, canned and bottled fruits and vegetables, cider, jam and honey. The judges in this competition, who were appointed by the Council for Art and Industry, were as follows:—

- | | |
|------------------------------|-----------------------------|
| Sir William Crawford, K.B.E. | Members of the Sub- |
| Mr. F. V. Burridge | Committee. |
| Mr. E. McKnight Kauffer | Curwen Press. |
| Mr. Oliver Simon | Shell-Mex & B.P. Ltd. |
| Mr. Jack Beddington . . . | Victoria and Albert Museum. |
| Mr. Martin Hardie | |

Over 600 designs were submitted by one hundred and seventy-two competitors. On the whole the standard of the entries was somewhat disappointing; the only designs possessing any merit were, as a general rule, submitted by artists already engaged in commercial work. One is left

IMPORTANCE OF ATTRACTIVE LABELS

with the impression that artists have not yet adequately studied the needs of the industries concerned.

The awards in the competition were as follows:—

Ministry of Agriculture Labels.

1st Prize of £20.

40-lb. Apple Box
12-lb. Tomato Box

Peter Morgan,
5a, Edith Grove,
Chelsea, S.W.10.

2nd Prize of £10.

40-lb. Apple Box
Single-layer Apple Tray

N J. Dutton,
26, Beecroft Road,
S.E.4.

Two 3rd Prizes of £5.

40-lb. Apple Box

Trevor Morris,
249, Goldhurst Terrace,
Hampstead, N.W.6.

Do.

Maurice V. Bennett,
9, Russell Gardens,
Golders Green, N.W.11.

Private Brand Labels.

1st Prize of £20.

No. 2 Can for Fruit

W A. Arnold,
61, St. Anthony's Avenue,
Woodford Green, Essex.

2nd Prize of £10.

Pint Cider Bottle

Mark F. Severin,
Riverhall Old Rectory,
Witham, Essex.

Two 3rd Prizes of £5.

Pint Cider Bottle

Trevor Morris,
249, Goldhurst Terrace,
Hampstead, N.W.6.

Do.

Clement Dane Studio Ltd.,
190, Strand,
W.C.2.

Small Tie-on Labels.

Two Prizes of £5.

Soft Fruit Chip Basket
(Ministry Label)

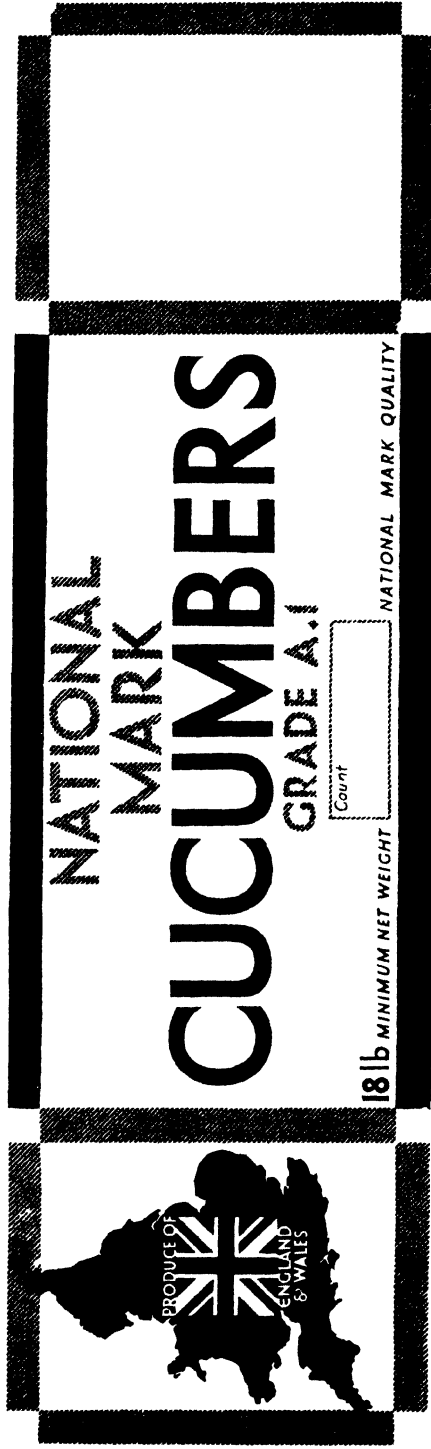
Wallace L. Bryson,
42, Lindsay Avenue,
Levenshulme, Manchester.

Bag of Topped Carrots
(Private Brand Label)

William Riddick,
13, Hillingdon Avenue,
Heswall, Cheshire.

Illustrations of the winning designs in the two main sections are given on the accompanying inset plates.

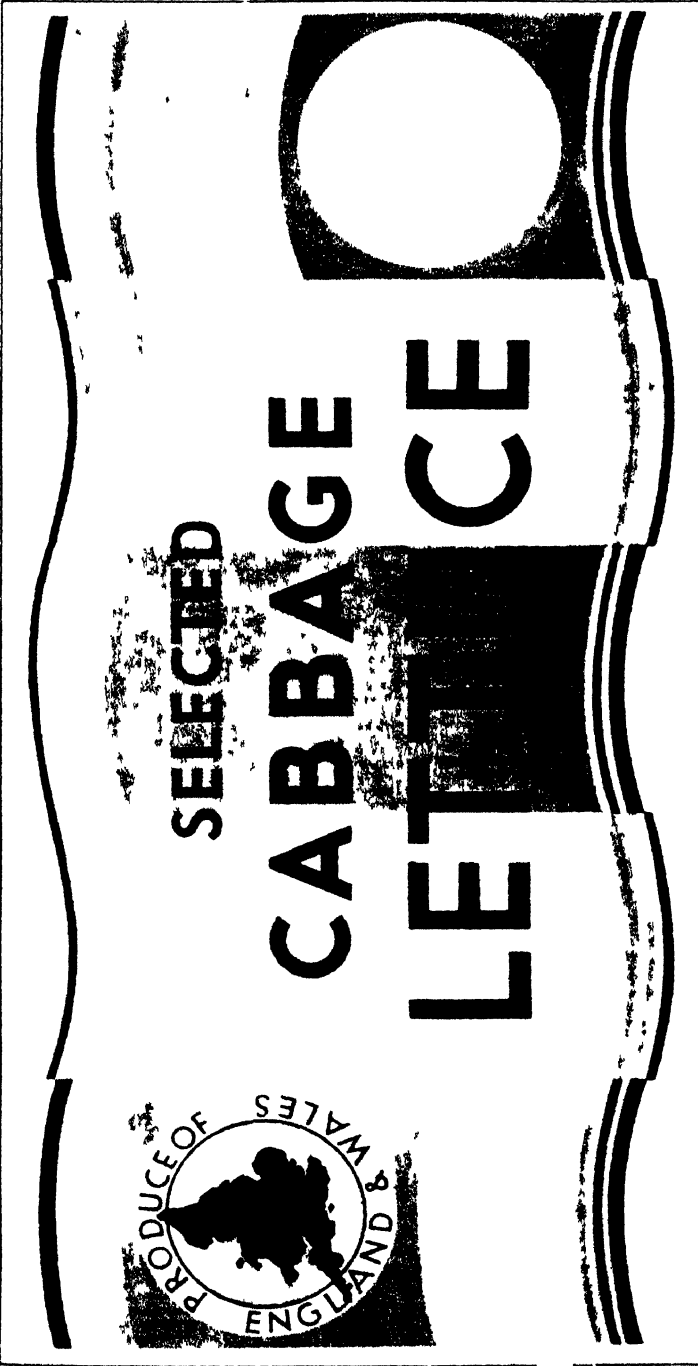
The interest shown by visitors indicated an awakening recognition of the importance of good labels. Some visitors paid more than one visit to the exhibition and brought different producers with them each time. One inquirer was



R P Gosop.

COMMISSIONED DESIGN.

Cucumbers for P & J only



Margaret Calkin Jones

COMMISSIONED DESIGN

Stuck on the wall

IMPORTANCE OF ATTRACTIVE LABELS

anxious to obtain an attractive design suitable both for a box and a can; another desired a label for a mushroom container, and a third a label for watercress; a fourth asked to be put in touch with a particular artist who was represented in the exhibition. Other inquirers were advised as to studios and artists who would be prepared to submit designs to suit their particular requirements.

One cause for regret is that the competition produced no outstanding design for a can label, particularly as the canning industry was so strongly represented at the Imperial Fruit Show. There is admittedly room for improvement in the labels used for our canned products.

The exhibition also included a display of labels in use in the United Kingdom and the Empire, and in foreign countries. Considerable interest was shown in this section, of which perhaps the most striking feature was the selection of Swiss, Portuguese and German labels.

IMPERIAL FRUIT SHOW, 1934

THE Imperial Fruit Show held at Leicester from Nov. 2-10, 1934, will be memorable for the magnitude and wonderful quality of the competitive entries. These entries were 25 per cent. more numerous than in 1933, and reached a standard of appearance previously unequalled. They were staged in a position of honour in the centre of the large hall and became an attraction to every visitor. Every package appeared so perfect that it seemed impossible to pick out the best. Many visitors must wonder how it is possible to judge exhibits so large and numerous as these. When the packages in a class can all be seen at once, judging by comparison is possible, for the best stand out. In this competition, the eye at any one time sees but a fraction of the packages in the competition, and the judging has therefore been carefully organized, marks being awarded to each package. Competitors already know something of the working of this system, but the precise method is unknown to many growers and to the general public; it is described below both to show that the exhibits are fairly judged, and that if they are studied in conjunction with the score card, they have a great educational value.

Number of Entries.—The number of individual exhibitors amounted to over 200, and the total number of exhibits to 820. Each exhibit represented a varying number of packages, such as 50 half-boxes of apples (in the United Kingdom Championship classes 2 and 9) or 10 trays of apples. There were thus 3,500 packages distributed between the different classes as follows:—

Apples	..	2,789
Pears	..	212
Oranges and Grape Fruit		150
Dried Fruit	.. ..	14
Canned Fruit (6,240 cans)		260
Jam and Preserve (336 jars)		28
Cider (Bottles)	.. ..	72
Honey (732 jars)	.	74
Grand Total	.. ..	<u>3,599</u>

The actual volume of fruit involved may be judged from the fact that each box of apples would contain about 150 apples, so that the total number of apples must have exceeded 400,000.



Imperial Fruit Show, 1934 Apple Grading Demonstration at Progress at the Ministry's Stand.



Photo Midland Press Agency

In a room of 194. A. n. the 1940s

IMPERIAL FRUIT SHOW, 1934

Awards.—In each of the 31 classes, in the schedule, among which the exhibits were distributed, 1st, 2nd and 3rd prizes were awarded, as well as a number of special prizes. Altogether 445 awards were made.

Judges.—The judges were confronted with a heavy task. They worked in a team, and were divided into smaller groups or panels, co-ordinated by a single leader—the Chairman, Mr. H. V. Taylor (Horticulture Commissioner).

Method of Judging.—The judging at the Imperial Fruit Show is done on the score card method, the judges awarding points to each exhibit in writing on their score cards. The score card is previously compiled by the Schedule Committee (not the judges) with due regard to the relative importance of each point. In the score card for apples, out of a total of 100, 55 points are related to the fruit itself and 45 to the packing. The "fruit points" are further divided into 3 groups—(1) condition, 20 points, (2) colour, 20 points, and (3) freedom from pests and diseases, 15 points. The "packing points" are also divided into 3 groups, viz., (1) arrangement, (2) solidity of pack, and (3) uniformity of size and colour, total 100.

The judges form a number of panels, each of which consists of two members having a special knowledge of the groups they are to judge. The plant pathologists undertake the scoring of the fruit for pests and diseases; physiologists for internal condition; packing experts award the packing points, and market salesmen the marks for colour, skin quality, and finish.

Each panel works independently, judging each package and entering the points awarded on their score sheets, which are finally returned to the "judges' room" where the points are all entered in large ledgers and finally added up. Awards are made to the exhibits winning the highest aggregate of points. It is also possible to award the special prizes in relation to any isolated group of points, such as the prize offered to the competitor who wins the highest number of points for packing, or for the exhibit gaining the highest marks for freedom from pests and diseases. The judges must work quickly, for the points have to be added up, the awards made and the score card prepared for the printer; judging, compiling and printing are carried on simultaneously, so that the printed score book may be purchased by the public when the Show opens. It is thus possible for the exhibitor to examine his exhibits and see from the score book exactly how points have been gained and lost: this is one of the educational aspects of the Show. Sometimes the fruit is perfect but the packing faulty, sometimes the reverse, but the score card makes this clear.

Each year the standard of the exhibits rises higher, and this, obvious to the most casual observer, is proved by the figures. The points necessary to obtain a 1st class award at the 1934 Show ranged between 90 and 98½, for a 2nd class between 81½ and 97½, and for a 3rd class between 81 and 96½. Even with this extremely high standard the competition was very close in all classes, ½ point often representing the difference between two exhibits.

IMPERIAL FRUIT SHOW, 1934

In Class 3 of the United Kingdom Championship, for which 4 $\frac{1}{2}$ -boxes of a dessert variety have to be shown, there were 18 competitors, all of whom gained 82 $\frac{1}{2}$ marks or more. Ten of the competitors gained over 90 marks, the 1st prize being awarded to an exhibit with 97 points, the 2nd, 95 $\frac{1}{2}$ points, and the 3rd, 95 points, whilst the Very Highly Commended and the Highly Commended had 94 $\frac{1}{2}$ and 94 $\frac{1}{2}$ points respectively.

In Class 2, 50 $\frac{1}{2}$ -boxes of dessert apples must be entered, and in Class 9, 50 boxes of culinary apples. Notwithstanding these large quantities the standard reached was very high; the 1st prize in Class 2 was shared by Mr. A. T. Miller and Messrs. Seabrook, both scoring 92 $\frac{1}{2}$ points; the 3rd prize was again shared by F. P. and C. P. Norbury and Messrs. Seabrook with 91 $\frac{1}{2}$ points. In Class 9 the 1st prize was won by the Hollesley Bay Labour Colony with 92 $\frac{1}{2}$ points, Messrs. G. Edmonds & Son were second with 91 points, and Messrs. Seabrook & Sons third with 90 $\frac{1}{2}$ points.

Varieties.—Further study of the exhibits provides some evidence of the relative popularity of the different market varieties. The position of Cox's Orange Pippin as the pre-eminent English dessert variety is unassailed: there were 28 entries for the United Kingdom Class III for 4 boxes of this variety, while 6 of the 12 entries in the British Empire Class, in which any variety may be exhibited, consisted of Cox's Orange Pippin. The next most popular dessert varieties at the Show were Ellison's Orange, of which there were 12 entries in Class 4, and Laxton Superb, 12 entries in Class 5. Allington Pippin, once much more widely grown, appears to be decreasing in popularity, for there were only 9 entries in Class 7. There were only 4 entries of Worcester Pearmain in Class 6, but this variety is an early one, and most of the crop has already been marketed.

Without doubt, Bramley's Seedling is the pre-eminent culinary apple; there were 22 exhibits in Class 10 for 4 boxes of this variety, while 7 out of the 11 entries of culinary apples in the British Empire Section were Bramley's Seedling. The attractive Newton Wonder is the next most popular culinary apple for Show purposes; there were 12 exhibits of this in Class 11 and only 11 exhibits of Lane's Prince Albert in Class 12.

Similar observations can be made in respect of pears. In Class 23, 11 entries of Doyenné du Comice pears were shown, although three of these came from Jersey, where the climate, especially in seasons less warm than 1934, is more suitable to this variety than most parts of England. Seven entries of Conference were shown in Class 24 and 9 entries of this variety in Class 25, suggesting that it is the most popular English variety.

Packing.—The relative popularity of different packages can also be judged from the exhibits shown. For culinary apples, boxes seem to be preferred to barrels, for while there were 22 entries of Bramley's Seedling in Class 10 (for boxes) there were only 11 in Class 14 (for $\frac{1}{2}$ barrels). Similarly there were 12 exhibits of Newton Wonder in boxes and 7 in $\frac{1}{2}$ barrels, and 11 exhibits of Lane's Prince Albert in boxes and only 2 in barrels. The bushel sieve, however, seems to be maintaining a certain degree of popularity, and there were 11 excellently packed exhibits of these in Class 18.

The standard of packing in all classes was extremely high, and the prizes awarded to the exhibit gaining the most points for packing were gained by Messrs. Seabrook (44 out of 45), and equal 2nd H. Brice and H. Mount (43 $\frac{1}{2}$ out of 45).

The effective raising of the packing standards must be largely attributed to the educational work carried out by the County Instructors, helped by the propaganda of the National Mark Scheme. There is not much to say on the type of package used or the method of packing employed, as these are now becoming standardized as certain

IMPERIAL FRUIT SHOW, 1934

types and methods are being accepted as the most convenient for marketing apples. In fact standardization has been almost reached in the $\frac{1}{2}$ -boxes, boxes, and $\frac{1}{2}$ -barrels.

These competitive entries, however, form but a small part of the whole Show; they naturally are the centre of attraction to the growers, but the Trade Exhibits occupy the largest proportion of the floor space. Insecticide, spray-fluid and machinery manufacturers, wholesalers, etc., all have their stands where business of the fruit-growing industry is transacted. Similarly, stands put up by numerous canning factories were impressive displays, attracting the retail growers, who attended in large numbers, and the general public to the superb quality of English canned produce. Perhaps the general public showed the greater interest in the complete canning "line" of British manufacture, and the demonstrations showing every operation involved in the canning of fruit.

The Show was given its true Imperial aspect by the inclusion of very attractive exhibits from each fruit-growing country of the Empire—South Africa, Canada, Australia, Malaya, and Northern Ireland. England's exhibit was an imposing display of National Mark produce by the Ministry of Agriculture, and on the same stand grading and packing demonstrations were in progress to show growers the methods by which these National Mark fruits are packed.

THE WORKING OF THE SEEDS ACT, 1920, IN THE SEASON 1933-34

THE past seed year may be characterized as "mainly fair" as far as the operation of the Seeds Act is concerned. The purity and germination of the control samples tested were high generally, while contraventions of the Act and Regulations were comparatively few and mostly of minor importance.

General Operations.—Most seedsmen now regard compliance with the requirements of the Act as an integral part of their business routine, but each season brings its tale of minor omissions and discrepancies, such contraventions being more frequent on the part of small traders who occasionally deal in seeds. Fortunately these matters can usually be rectified by a reminder or warning, without recourse to legal proceedings, but constant vigilance is nevertheless required to combat the possibility of slackness that might, if not checked, render ineffective the safeguards provided by the Act. There still remain a certain number of traders who may be described as "difficult," and who need constant visiting to secure their compliance with the requirements of the Act, but this class of seedsman is happily on the decline.

Visits to Seedsmen.—There is in these days an increasing tendency towards the sale of pre-packed goods, and to this movement the seed trade is no exception. As a consequence the number of whole-time retail dealers in garden seeds is steadily dwindling, while there is an increase in the number of sellers of packeted seeds. With agricultural seeds there is a marked tendency for the retailer to become merely an agent taking orders that are passed on to the wholesaler for direct delivery to the customer. These changing conditions are in many ways advantageous from the point of view of the administration of the Act, since the larger suppliers, whether of agricultural or of packeted seeds, form more reliable and easily watched channels through which flow the major part of the country's seed supplies. Moreover, sellers of packeted seeds now purchase, as a general rule, on a "sale or return" basis, the responsibility for dealing

WORKING OF THE SEEDS ACT: SEASON 1933-34

with the old seed at the end of a season resting upon the wholesale supplier. There still remains, however, a considerable trade in packeted seeds where the sale to the shopkeeper is "outright." As might be expected, this system results in packets of old and often worthless seeds being exposed for sale by small retailers year after year, the provisions of the Act being infringed, and inconvenience or loss caused to all concerned. No small part of the Inspectors' time is taken up in tracing these small traders and putting them on right lines.

Farmers and the Act.—There are indications of a diminution in the number of farmer-to-farmer sales of untested seed, and there is no doubt that the efforts of the Ministry to deal with this particular offence against the Seeds Act have been aided, where cereal seed is concerned, by the operation of the Wheat Act. During the past year the Ministry has issued Press notices concerning the sale of untested seeds, and there appears to be a growing realization—especially amongst the younger farmers—that it is false economy to sow untested seed of any description, however low the price. Infringement of the Act in this respect will automatically cease when buyers refuse to accept seed unless it is accompanied by its proper declaration.

Records show that a substantial increase has occurred during recent years in the number of farmers who send seed for testing to the Official Seed Testing Station at Cambridge, and this may be regarded as an indication of the farmer's appreciation both of the benefits and the responsibilities conferred by the Seeds Act.

Sellers of Seed Potatoes.—The enforcement of the Act in relation to sales of seed potatoes has always presented certain difficulties, particularly with the farmer or small shopkeeper who disposes of an occasional odd lot or is tempted by market conditions to enter the trade temporarily. These sellers are often ignorant of the legal requirements, and are difficult to trace. Barter between merchant and farmer, when the Act is entirely ignored, is also not unknown. All suitable opportunities are taken to bring home to farmers their duties as sellers, and a series of exhibits has been prepared for use at agricultural shows (see illustration facing p. 860) indicating plainly the particulars that have to be stated on sales.

Wherever possible the co-operation of auctioneers is

WORKING OF THE SEEDS ACT: SEASON 1933-34

sought and, on the whole, it may fairly be claimed that the position improves steadily.

Private Licensed Seed-testing Stations.—One firm of seedsmen gave up its licensed station during the year, thus reducing the total number in England and Wales to 78. These stations are, generally speaking, owned by the more important wholesale houses, and are specially licensed by the Minister to test seeds for the purposes of making declarations required by the Act, although only in respect of the licensee's own purchases and sales. The licences vary in scope from the "full" licence that allows of the testing of all kinds of seeds affected by the Act to the licence covering the testing of cereal seed only. The supervision of these stations is obviously of primary importance; and in addition to periodical visits by Inspectors, a duplicate of each sample tested must be put aside by the Private Stations to form what are termed "Reserved Portions." Selections from these are made by Inspectors for check-testing at the Official Station, and inquiries are made into discrepancies between results, either by correspondence or interview. The check-testing of Reserved Portions for the 1933-34 season showed the best results since the Act came into force, the gross number of the discrepancies being less than 7 per cent. of the total tests checked at Private Stations. Quite a number of these differences were not due to faulty testing but to such causes as "drying out" or "going off" of the seed in the interval between the Private and the Official tests.

During the year, two batches of "Referee Samples" (each sample being drawn from a uniform bulk) were also tested at Private and Official Stations, and the results tabulated and circulated for comparison. Every effort is made to ensure efficient testing at the Private Stations and so to secure uniformity in methods and results. The relations between the Official and Private Stations continue to be most cordial.

Control Sampling.—The number of samples taken during the season for the purpose of checking the particulars declared on the sale of seeds was 1,071. They included 336 grasses and clovers, 95 cereals, 101 field seeds (other than sugar-beet), 244 "loose" garden seeds, 214 packeted seeds, and 81 sugar-beet and seed potatoes.

"Loose" Seeds.—Omitting packeted seeds for the moment, the following cases were taken up, viz., 35 dis-

WORKING OF THE SEEDS ACT : SEASON 1933-34

crepancies in the particulars declared and 21 omissions from, or incomplete, declarations. The 8 purity discrepancies included 7 in respect of grass and clover seeds, and 1 of garden seed. Of the 21 germination discrepancies, 12 were in relation to grass and clover seed (most of which were due to "drying out" of the seed after it had first been tested), and 9 related to field and garden seeds. Three of the purity discrepancies were within 3 per cent. of the declared figure, 2 showed a variation of between 3 and 5 per cent., and 3 were of more than 5 per cent. Of the germination discrepancies 7 were of less than 10 per cent., and 5 others were of less than 15 per cent., leaving 9 in which the difference between the germination declared and that found in the check tests amounted to more than 15 per cent. To summarize: the figures in respect of non-packeted seeds show that 6.5 per cent. called for special attention—0.9 per cent. in regard to purity, 2.5 per cent. on account of germination, and the remaining 3.1 per cent. because of an omission from or mistake in the declaration.

Packeted Seeds.—Of the 214 samples of packeted seeds taken during the season, 8 (or 3.7 per cent.) disclosed germination discrepancies. No discrepancies in purity were found, however, but 6 declarations were incomplete.

Seed Potatoes.—Ten cases of misdescription of variety were investigated (5 of which concerned Scottish sellers and were accordingly referred to the Department of Agriculture for Scotland), and 3 of false particulars of size and dressing (of which 1 was in regard to a Scottish seller). Six further cases necessitated inquiries, as the statutory statements were either not supplied to the purchaser or were incomplete in regard to one or more items.

Other inquiries were made in response to complaints that were eventually found to be without foundation or were out of date for action under the Act, and a number of warnings were sent to sellers as a result of more or less minor irregularities that were reported by Inspectors.

Prosecutions.—Three prosecutions were instituted under the Act by the Ministry during the 1933-34 season and three others, in regard to sales into England, by the Department of Agriculture for Scotland. The first English case concerned a Hampshire firm who were charged with making a declaration based on an unauthorized test. The defendants pleaded "Guilty," and were convicted and fined £2.

WORKING OF THE SEEDS ACT : SEASON 1933-34

Another important firm of seed merchants in Lincolnshire were prosecuted for failure to deliver certain of the required statutory particulars on sales of seed peas and seed potatoes. They also pleaded "Guilty" and were duly convicted and fined £3. The third case involved a charge against a Northumberland firm of seedsmen for giving a false statement of the germination of a Control Sample of turnip seed. Although pleading "Not Guilty," they were convicted and fined £1.

The three Scottish cases were all concerned with sales of seed potatoes. Two were taken against the same merchant, the charges in both instances being for false statements as to the variety of potatoes supplied. Both prosecutions were successful, and fines of £3 were imposed on each occasion. The remaining case, which was also in respect of an alleged false statement of variety, was not successful.

Seed Analysts' Bulletin.—The 23rd and 24th Numbers of the Bulletin were circulated in December, 1933, and June, 1934, respectively, and besides the full results of and notes on the testing of "Referee Samples," contained, *inter alia*, articles on the following subjects:—The English Wild White Clover Certification Scheme; The Rapid Determination of Moisture Content of Wheat; Sampling for Seed Testing; Cereal Synonyms; and the Activities of the International Seed Testing Association in the years 1932-34.

Fees for Seed Testing.—The reductions and discounts on the fees* charged at the Official Station, Cambridge, which have been in force as a temporary measure during the past three years, have now been made permanent.

Publications.—A convenient summary of the requirements of the Act and Regulations, showing also the fees for testing at the Official Station and the size of the seed samples to be sent, may be obtained free of charge on application to the Ministry at 10, Whitehall Place, London, S.W.1, as also may a memorandum on the drawing of samples for testing. Copies of the full text of the Seeds Act, 1920 (price 3d. net); the Seeds (Amendment) Act, 1925 (price 1d. net); and the Seeds Regulations, 1922 (price 3d. net) are obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller.

* See this JOURNAL for March, 1932, p. 1228.

REPORT ON THE WORK OF THE EDUCATION AND RESEARCH DIVISION OF THE MINISTRY FOR THE YEAR 1932-33*

III.—HORTICULTURE

Destructive Insects and Pests Acts, 1877 to 1927.—

These Acts enable the Minister to take such measures as he may deem necessary for preventing the introduction into England and Wales of any insect, fungus or other pest destructive to agricultural or horticultural crops, and for the prevention of the spread of such pests in the country. The powers thereby conferred are exercised by means of Orders made as occasion arises. The Orders now in operation have in view the prevention of the importation of unhealthy material for planting and of produce likely to introduce specific pests, such as the Colorado Beetle, the Cherry Fruit Fly and the Apple Fruit Fly; the prevention of the sale of unhealthy material for planting; the prevention of the spread of specific diseases, e.g., Wart Disease of Potatoes, Silver Leaf and Onion Smut; the eradication of pests of which colonies have been found in the country but which have not definitely established themselves, e.g., the Colorado Beetle; the prevention of the spread of infection from orchards in which a satisfactory standard of plant hygiene has not been maintained.

Details of the action taken under the various Orders during the year 1933 are given in the following pages, but in the first place reference must be made to two events of importance—the discovery of the presence of Colorado Beetle at Tilbury and Gravesend, and the revision of the Destructive Insects and Pests Order of 1922.

Colorado Beetle.—The fear of the introduction of this beetle from America was responsible for the passing of the Destructive Insects Act, 1877, but it was not until 1901 that the powers conferred by that Act were exercised to deal with an infestation in this country. The measures taken on that occasion effectively dealt with the pest, and it had not subsequently been recorded here until its appearance,

* This instalment concludes the Report. Part I, dealing with Agricultural Research (including Local Investigation and Advisory Work) appeared in the issue for October, 1934, and Part II, dealing with Agricultural Education, was published last month (November, 1934).

EDUCATION AND RESEARCH REPORT.—III

again at Tilbury, in 1933. The various Destructive Insects and Pests Orders made between 1908 and 1922 gave general powers to deal with the appearance of the Colorado Beetle and certain other exotic insects and diseases; but no occasion arose for their exercise until the discovery of the presence of the pest in France was reported in 1922.

In that year, for the first time since 1877, an Order was made restricting imports of plant produce on account of the risk of the entry of the beetle. That Order applied to produce grown in certain Departments of France and was followed by other Orders culminating in the Colorado Beetle Order of 1931 (now embodied in the Importation of Plants Order of 1933, to which reference is made later), which prohibited the importation of potatoes from France, and imposed restrictions on the entry of vegetables and nursery stock. These restrictions, by reason of the rapid extension of the infested areas in France, amount to prohibition so far as the greater part of that country is concerned. The importation of potatoes from the United States and Canada was prohibited in 1924 and 1925 respectively.

Previous appearances of the beetle in Europe (in 1876, 1877, 1887 and 1914 in Germany and in 1901 in England) had demonstrated the fact that the risk of its introduction was by no means imaginary despite the long distance separating both countries from any centre of infestation. They had also demonstrated that, provided that prompt and effective action is taken to eradicate the pest on its introduction, it is possible to prevent its establishment in a new country. The establishment of the beetle in France and its steady progress from the original colony near Bordeaux towards the Channel coast obviously intensified the risk of its entry into England and Wales, notwithstanding the precautions taken to prevent the entry of categories of produce most likely to introduce the pest from areas of infestation in France: it was necessary, therefore, to take steps to ensure the prompt discovery of any colonies of the beetle that might have found their way into potato crops, and to devise for their eradication a plan of campaign that could be put into operation at very short notice.

A leaflet describing the appearance of the beetle had been in circulation for many years and, through the co-operation of branches of the National Farmers' Union, Allotment Societies and Women's Institutes, was widely distributed among those concerned with the cultivation of

EDUCATION AND RESEARCH REPORT.—III

potatoes. A further measure of publicity was obtained by displaying on docks, railway stations, etc., in the neighbourhood of ports, a coloured poster of which some 28,000 copies were issued in 1932 and 1933.

The plans for the eradication of any colonies that might appear were based upon the assumption that outbreaks would be discovered in their initial stages and that consequently the areas infested would not exceed a few acres. They contemplated (a) a thorough survey of all potato crops growing in the district where the beetle was found; (b) the avoidance of any measure likely to disturb the beetles and drive them to fresh fields; and conversely, (c) the adoption of measures likely to encourage the beetles to remain on known centres of infestation. Accurate knowledge of the precise area infested is of course essential if operations are to be conducted with a maximum of efficiency and economy. It would be unsafe to assume that every grower on whose premises the beetle existed would be able to recognize the pest or that he would report immediately if he suspected its presence. A thorough examination of the crops by officers familiar with the appearance of the beetle and trained to look for the signs of its presence is obviously the only method to be followed. The reasons for (b) and (c) are perhaps not so obvious to the general public and will therefore bear some explanation.

The natural instinct of any grower who may find a pest of any description among his crops is to take immediate steps for its destruction, and such steps would be very likely to assume the form of applying a poisonous wash. It is probably true to say that this would result in the destruction of most of the beetles and larvae present on the potato haulms, but it is equally probable that some of the beetles, disturbed by the application, would fly away to fresh fields where new colonies would be started. For this reason it was resolved that, in the event of an outbreak, the actual area infested should not be sprayed, but that reliance should be placed on the collection and destruction of all beetles and larvae. Powers were therefore taken to prohibit any treatment of an infested crop by any person except under the authority and in accordance with the instructions of an inspector of the Ministry. In considering the steps to be taken to encourage beetles to remain on infested sites regard was had to the fact that there are beetles underground in infested areas during a considerable

EDUCATION AND RESEARCH REPORT.—III

part of the summer and that during the winter the pest hibernates in the soil. On emergence the beetles at once look for food and if potato plants are present on the site, it is unlikely that the insects will look further afield. Experience in connexion with the Tilbury outbreak in 1901-2 demonstrated the success of the planting of potatoes as a trap crop in the season following an infestation and provision was accordingly made for the compulsory planting of potatoes on infested sites.

Further precautionary measures against the spread of the beetle were held to be necessary. Careful search should reveal the presence of even a single beetle in a small area of potatoes, but the discovery of isolated specimens in a large field crop would involve a measure of good fortune equal to that required in the proverbial quest of a needle in a haystack. It was therefore necessary to devise some means of reducing to a minimum the chances of survival of any migrants from infested places, and any isolated small colonies or individual beetles that might have been overlooked during the survey. It was therefore decided that an integral part of any campaign against the beetle should be the application of an arsenical wash to all field crops of potatoes within a suitable radius of the centre of infestation; and that domestic potato crops, on which the use of any mixture containing arsenic would be highly undesirable, might be treated with a non-poisonous substance such as a derris compound.

Finally, in order to reduce the hibernating population of beetles as far as possible, it was resolved that in all instances where the size of the infected area rendered the treatment feasible, the soil should be fumigated with carbon disulphide.

The general lines of action described above were decided upon after a careful review of the experience of other countries in dealing with outbreaks of the pest. The powers necessary to enable the Ministry to act on these lines in the event of an outbreak were embodied in a draft Order (eventually issued as the Colorado Beetle Order of 1933)* which was kept ready for issue, and was eventually issued within an hour of the discovery of beetles on the allotments at Tilbury. The remaining step was to make arrangements for the personnel, machinery and material requisite for the spraying of field crops of potatoes to be available at

* See page 870.

EDUCATION AND RESEARCH REPORT.—III

a few hours' notice. This object was achieved by means of an agreement with a firm experienced in the contract spraying of potatoes, whereby the contractors undertook to keep available a number of horse-drawn spraying machines and a stock of spraying material and to commence operations in any part of England or Wales 48 hours after the receipt of instructions from the Ministry.

It may be asked why the cost of this large-scale spraying of potatoes should be borne on public funds, and why growers of potatoes should not be required to carry out at their own charges such measures as may be necessary to prevent the establishment in their crops of a pest so destructive as the Colorado Beetle. These questions would be pertinent in the case of diseases or pests already established in the country: they lose their force when applied to situations such as that now under discussion. Prompt and drastic measures are absolutely essential to prevent the establishment of a new and mobile pest. Ignorant or careless methods of treatment, as previously indicated, are likely to result in the diffusion of a pest rather than in its extirpation. It follows, therefore, that the necessary operations must be carried out on uniform lines and under expert supervision. Moreover, as previously shown, the preventive measures must be applied over a comparatively wide area round the centre of infestation. Growers whose farms are situated on the periphery of that area and whose potato crops are, perhaps, a relatively unimportant feature of their husbandry, might well demur to the expense entailed by spraying, perhaps over a period of years, against a pest of which they might know little and a risk that they might regard as remote. The difficulties of securing uniform action throughout the area would therefore be very great. The view taken by Parliament when the Destructive Insects and Pests Bill (now the Act of 1927) was under discussion was that the prevention of the establishment of non-indigenous destructive insects and pests is a matter of national importance, and the Minister was therefore given powers to enable him to defray from public funds the cost of the operations necessary to that end. When it is remembered that the annual value of the potato crop in England and Wales is of the order of eleven and three-quarter million pounds, and that the permanent establishment of the Colorado Beetle in the country would involve a substantial increase in the cost of cultivation, the decision to regard the

EDUCATION AND RESEARCH REPORT.—III

freeing of the country from its presence as a national duty is unlikely to be questioned.

Revision of the Destructive Insects and Pests Order of 1922.—The Report of the Intelligence Department of the Ministry on its work during the three years 1921-24 contained (pp. 132 *et seq.*) a review of the considerations that led to the imposition of regulations governing the entry into this country of plants and plant products from abroad and set out the policy decided upon by the Ministry. That policy was summarized by the statement that “although a certain measure of risk must always attend the entry into the country of trees, plants or living plant material from overseas, that risk is minimized by the issue of health certificates by duly authorized officers of the Phytopathological Service of the country of origin, . . . and is outweighed by the advantages obtained by the introduction of new varieties and new strains of old varieties.” Broadly speaking that statement still holds good, but the experience gained during the twelve years’ operation of the Order and its predecessor has shown that the health certificate system is not capable of universal application: there are some pests the presence of which cannot readily be detected during an examination of the produce immediately before export, e.g., the Cherry Fruit Fly, while the destructive nature of others, e.g., the Colorado Beetle, renders it unsafe to permit the importation of their host plant or of its produce.

It was found necessary, therefore, at various times to supplement the general safeguards embodied in the Order of 1922 by separate Orders prohibiting the entry of potatoes from Canada, the United States of America and France; restricting to certain periods the entry of cherries from France, Italy and Germany; restricting the entry of produce from certain districts of France; and restricting, during part of the autumn, the entry of apples from the United States of America.

The Order of 1922 required every consignment of imported plants (except herbaceous plants) to be accompanied by an official certificate of health, but provided that consignments not so accompanied could proceed to their destination, where they were required to be held until they had been examined and passed as healthy by an Inspector of the Ministry. That provision was not regarded as entirely satisfactory, but it was necessary owing to the

EDUCATION AND RESEARCH REPORT.—III

difficulty of making arrangements for the detention and inspection of uncertified consignments at the port of entry. That difficulty has now been overcome, and under the new Order no uncertified consignments are allowed to leave the port of entry except under special authorization from the Ministry.

In framing the 1922 Order an attempt had been made to specify the insect pests and plant diseases most likely to prove destructive to crops if introduced into this country, and powers were taken enabling the Ministry to deal with any of the pests and diseases so scheduled. During the review of the working of the Order it became evident, however, that the list was not sufficiently exhaustive, and, moreover, that it was hardly practicable to draw up a detailed list of all the potential crop enemies that might be introduced. It was decided, therefore, to replace the schedule by a clause giving power to deal with any appearance of a non-indigenous insect or plant disease and to include that clause in an Order separate from that dealing with the importation of plants. Finally it was decided that it would be more convenient if the Orders prohibiting or regulating the importation of plants and plant products were combined as far as possible in one Order to which reference could easily be made. It was necessary to exclude two Orders from the "omnibus" Order: that dealing with the restrictions on the entry of raw cherries, the provisions of which are subject to variations from year to year, and that prohibiting the entry of elm trees and certain conifers. This latter Order has been made in pursuance of an arrangement with the Forestry Commissioners under Section 3 (2) of the Forestry Act, 1919, whereby all Orders relating to the importation of plants, trees, etc., into England and Wales are made by the Minister. The new Order—the Importation of Plants Order of 1933—came into operation on July 15, 1933: it is described in detail later in these pages.

On the same date there came into operation the Destructive Insects and Pests Order of 1933. That Order continues, in the amplified form previously indicated, the powers to deal with outbreaks of non-indigenous pests and diseases that were bestowed by Art. 5 of the Destructive Insects and Pests Order of 1922. It contains also an important new provision designed to prevent the careless or ignorant introduction and liberation of insects that might prove to be destructive if they became established in this country. It

EDUCATION AND RESEARCH REPORT.—III

is not definitely known that any of the "undesirable aliens" that have managed to establish themselves were deliberately introduced in ignorance of their destructive capacities, but it is well known that much loss has been caused in some other countries by the carelessness or ignorance of those who either deliberately or by accident have been responsible for the introduction of foreign species. A classic instance is that of the Gypsy Moth, the introduction of which into the eastern part of the United States of America was responsible for serious damage to the forest fruit trees of that region. The keeping, sale or release of any insect of a non-indigenous species except under a licence from the Ministry is now illegal.

Colorado Beetle Order of 1933.—This Order provides that the occupier of any land on which the beetle exists or is suspected to exist shall at once notify the Ministry. It authorizes an inspector to enter upon and examine any crop upon any land on or in the vicinity of which he has reason to believe that the Colorado beetle exists. The Order further empowers an inspector or other authorized person to enter any place that has been declared to be an Infected Place under the Order and to take such steps as he may think expedient for preventing the spread of the beetle. Similar powers are given in respect of any land to which in the opinion of an inspector the Colorado beetle is likely to spread from an Infected Place. Occupiers of land are required to render all reasonable assistance and facilities to the inspector in the discharge of his duties. Any person wilfully obstructing or impeding an inspector in the exercise of his powers or failing to comply with or acting in contravention of the Order or any notice thereunder, is liable to a penalty.

The Outbreak at Tilbury.—The circumstances relating to the discovery of the beetle in 1933 are possibly too well known to need much recapitulation here, but it may be desirable to summarize them briefly for the benefit of those who may not have read the complete report made by the Director of the Ministry's Plant Pathological Laboratory and printed in the issue of the Ministry's JOURNAL for January, 1934.

On August 21, 1933, a member of the staff of the Ministry's Plant Pathological Laboratory found on the landing stage of the Tilbury-Gravesend ferry a crushed

EDUCATION AND RESEARCH REPORT.—III

insect, which he recognized as a Colorado Beetle. A thorough inspection of the potato crops in the neighbourhood of the ferry was started immediately, and on August 23 two beetles were found in the soil of an allotment about half a mile from the ferry: no beetles or larvae were seen on the tops of the potatoes growing in the allotment, but there was some evidence that the foliage had been attacked and this fact attracted the attention of the searchers to the soil beneath. A force of inspectors was sent at once to the locality and proceeded immediately to examine all the potato crops within a radius of ten miles. No further specimens of the beetle were found as a result of this examination. The potatoes on the infested allotment were lifted, with the exception of a few plants that were left as a trap crop, and the haulms were burnt. The soil in the infected place was then fumigated with carbon disulphide in order to destroy any beetles that might have gone to ground.

It was decided to spray with an arsenical wash, within a radius of ten miles of Tilbury on the Essex side of the river, all potato crops that still remained green and in a favourable condition to attract the beetle. As regards the crops on the Kent side of the river it was decided that it would be sufficient to spray those within a radius of some five miles of Gravesend. The spraying operations, which were completed by September 8, involved the treatment of 2,012 acres, of which 1,193 were on the Essex side and 819 in Kent.

Fumigation with carbon disulphide of the soil of the whole of the infected place was again carried out in October. On October 10 a living beetle was discovered on the surface of the soil on the plot adjacent to the one originally infested, and two other beetles on another plot in the allotments. All three were found on or just below the surface of the soil and, with the exception of the first specimen, were dead or moribund, having apparently been affected by the fumes. Following this discovery it was decided that an inspection of the soil of allotments and gardens in the vicinity of the infected place should be carried out during the winter. As the result of this further inspection several more specimens of the beetle were found on both sides of the river, necessitating the declaration of nineteen additional "Infected Places." Wherever beetles were found the soil was fumigated with carbon disulphide.

It will be realized from the foregoing account that very

EDUCATION AND RESEARCH REPORT.—III

drastic measures have been taken to prevent the spread of the beetle from the infested sites. The searching of potato crops in private gardens, allotments and farms necessarily involves the entry of inspectors on to private premises, a procedure that is likely to arouse resentment unless it is accompanied by a maximum of tact on the part of the officials and of forbearance and co-operation on the part of the occupiers. Moreover, the compulsory spraying of field crops of potatoes must inevitably cause a certain amount of dislocation of the ordinary routine of the farm and in some instances may be strongly disliked by the grower of the crop. The Ministry desires to place on record here its appreciation of the public spirit displayed by all those concerned in facilitating the urgent and difficult task with which inspectors were confronted. Its thanks are especially due to the local branches of the National Farmers' Union, and to the various allotment Societies in Kent and Essex, for much valuable assistance.

The operations for the 1934 campaign will be described at length in the next Report, but it may be of interest to state that a close watch has been kept on all potato crops in the Tilbury-Gravesend areas and that, up to the time of going to press, only one beetle has been found. That insect was discovered, crushed, on a track at the side of one of the Infected Places and had probably survived the effect of the fumigation of the soil during the winter. The field crops of potatoes in the areas were sprayed with an arsenical wash in June, and the potatoes grown on allotments that were regarded with suspicion, because of their proximity to infested sites, were treated with a derris compound.

Importation of Plants Order of 1933.—This Order, as already explained, supersedes the Destructive Insects and Pests Order of 1922 and the various Orders subsequently issued prohibiting or restricting the entry of plants and plant products, with the exception of those dealing with raw cherries and certain forest trees.

The new Order requires all imported consignments of living plants and parts thereof (except seeds) for planting, and all potatoes, to have been officially examined by the authorities of the country in which they were grown and certified as having been "found to be healthy, no evidence of the presence of any insect, fungus or pest destructive to agricultural or horticultural crops having been found in

EDUCATION AND RESEARCH REPORT.—III

them." This requirement is not limited as in the Order of 1922 to plants "with a persistent woody stem above ground" but applies to all classes of living plants. The wording of the certificate is more comprehensive than that which required the plants to be certified as "healthy and free from any of the plant diseases or pests named in the Second Schedule to the Order."

An additional certificate is required, as under the Colorado Beetle Order of 1931, in respect of plants grown in France, to the effect that the Colorado Beetle does not exist and has not been known to exist within 200 kilometres of the place where the plants were grown.*

The prohibition of the importation of potatoes grown in the United States of America, Canada and France under the Colorado Beetle Orders of 1924, 1925 and 1931 respectively remains in force, and an additional clause prohibits the transshipment in English or Welsh ports of such potatoes, except under licence from the Ministry. The health certificate for potatoes from other countries, as prescribed under the previous Order, included an additional statement to the effect that no case of Wart Disease had occurred within 500 yards of the place where the potatoes were grown. It was decided that this distance should be extended to two kilometres (approximately $1\frac{1}{4}$ miles) in order that the restrictions on potatoes imported from overseas should approximate more closely to those imposed under the Wart Disease of Potatoes Order of 1923 on potatoes grown in Scotland and Ireland.

An additional provision of the new Order relates to cider apples. During the autumn of 1932 it was learnt that a consignment of French cider apples landed in England had been grown at a place in which the Colorado beetle had been known to exist. It is a common practice in parts of Normandy and Brittany for cider apples to be grown around potato fields and for the apples to be bagged in the fields. The risk of the introduction of the beetle by such means is accordingly not less than that appertaining to the importation of raw vegetables, and it was therefore decided that French cider apples imported between March 15† and

* This distance was amended by the Importation of Plants (Amendment) Order of 1934 to fifty kilometres from the nearest point of the boundary of the nearest *zone de protection*.

† Now April 8, or, as regards produce grown in certain northern Departments, April 21 (Importation of Plants (Amendment) Order of 1934).

EDUCATION AND RESEARCH REPORT.—III

October 14 in each year must be accompanied by the same form of certificate as that required during the same period in respect of raw vegetables grown in France. Raw vegetables and cider apples grown in other countries and imported during this period must be accompanied by certificates of origin.

The restrictions first imposed in 1930 on the importation of raw apples grown in the United States of America are embodied in the new Order, and between July 7 and November 15 in every year raw apples may be imported only when accompanied by an official certificate to the effect that they are of one or other of the two highest grades recognized by the Federal Department of Agriculture.

The Order provides that any imported plants, potatoes, raw vegetables or raw apples that are landed in contravention of the Order must be forthwith destroyed or re-exported at the expense of the importer unless they are otherwise disposed of in accordance with the terms of a licence issued by the Minister or by an inspector, and such licences may provide for the examination of the produce.

Inspectors of the Ministry are empowered to examine and take samples of any plants, potatoes, raw apples or raw vegetables that are landed or suspected of having been landed in England or Wales notwithstanding that the goods were accompanied by the prescribed certificates, and to serve notices requiring disinfection treatment, destruction or re-exportation of the whole or any part of a consignment found to be unhealthy.

The number of certificates received from all sources during 1933 again showed a decrease on the figures for the preceding year, the figures being 34,341 and 40,291, a decrease of about 15 per cent.; compared with the figures for 1931 the decrease amounts to more than 38 per cent.

The number of uncertified consignments also dropped from 317 in 1932 to 240 in 1933. With very few exceptions these uncertified consignments were found to be healthy and were released after examination. The following list shows the action taken in the six instances in which the health of uncertified consignments was found to be unsatisfactory:—

Egypt.—Three consignments of potatoes infested with the Potato Moth. One small consignment consisting of 4 cases only was destroyed; the remaining two consignments (591 and 785 cases) were re-exported.

EDUCATION AND RESEARCH REPORT.—III

Spain.—One consignment of potatoes infested with the Potato Moth. The whole consignment which consisted of 172 baskets was destroyed.

Singapore.—Maple tree and date palm infested with scale insects. The trees were disinfected.

United States of America.—One case of rose plants infected with Botrytis rot. The consignment was destroyed.

The arrangements that had been in force during the past three seasons for the examination at various ports of certified consignments of imported plants, etc., were continued during the autumn and winter of 1933. The inspection of some 650 consignments of plants and bulbs from different countries showed that most of them were generally healthy and in good condition: in very few instances was it found necessary to take action under the Order.

As in previous years, special attention has been given to certified consignments of new potatoes from the Canary Islands, and during the 1933 season orders were given for the destruction or re-export of 16 consignments, comprising 1,217 packages, by reason of the presence of tubers infested with the larvae of the Potato Moth (*Phthorimaea operculella*). Similar action was taken for the same reason in respect of the following consignments from other countries:—

South Africa	..	..	1 consignment (70 packages)
Cyprus	..	..	2 consignments (129 packages)
Spain	..	..	3 consignments (936 packages)

Between August, 1933 and February, 1934, 3,700 consignments of North American apples were sampled and examined. Fruits infested with the larvae of the Apple Fruit Fly were found in one consignment consisting of 40 barrels of apples that had been shipped from the United States to Denmark, and thence consigned to England. The whole consignment was re-exported to Denmark, and the circumstances were brought to the notice of the American Fruit Trade Commissioner in London. With this exception, no traces of infestation were discovered throughout the season.

Destructive Insects and Pests Order of 1933.—This Order, which was made at the same time as the Importation of Plants Order of 1933 and came into operation on the same date, prohibits the keeping, sale or release in any stage of its existence of any insect of a non-indigenous species except under licence from the Ministry. "Insect" as

EDUCATION AND RESEARCH REPORT.—III

defined in the Order, includes bacteria and other vegetable or animal organisms and any agent causative of a transmissible crop disease; "a non-indigenous species" is defined as a species or kind which is destructive to agricultural or horticultural crops or to trees or bushes and which at the date of the commencement of the Order was not established in Great Britain.

Inspectors of the Ministry are empowered to enter any premises on which they have reason to believe that any such "insect" is kept or that there are any plants attacked by any such "insect," and may serve notices requiring measures to be adopted for the prevention of the spread of the "insect."

Only one licence has so far been issued under the Order: this authorized certain cereal "rusts" to be kept at a scientific institution.

Importation of Elm Trees and Conifers (Prohibition) Order of 1933.—The Forestry Commissioners had for some time been considering the necessity of prohibiting the importation into this country of living conifers in order adequately to safeguard the forestry undertakings in this country from the risk of the introduction of new diseases and pests: and after consultation between the Commission and the Ministry, the latter issued the necessary Order "by arrangement with the Forestry Commissioners under Section 3 (2) of the Forestry Act, 1919."

The Order, which was signed on October 24 and came into operation on December 1, 1933, prohibits the landing in England or Wales from any country other than Scotland, Northern Ireland, the Irish Free State, the Isle of Man or the Channel Islands of any living plants or parts of plants of the following eight genera of the Order *Pinaceae*:—*Abies*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga*, *Sequoia*, *Thuja*, and *Tsuga*. The opportunity was taken to revoke the Importation of Elm Trees Order of 1926—which also had been made at the request of the Forestry Commissioners—and to embody its provisions in the new Order. The Order also requires that the health certificates prescribed under the Importation of Plants Order must, except in relation to a consignment consisting wholly of potatoes, include a statement to the effect that the consignment does not contain any plants of the prohibited genera.

EDUCATION AND RESEARCH REPORT.—III

Importation of Raw Cherries Order of 1933.—The last report (see this JOURNAL, Vol. XL, No. 9, December, 1933, pp. 836-7) contained particulars of the measures adopted in 1932 to prevent the importation of cherries infested with the larvae of the Cherry Fruit Fly. It may be recalled that in that year very few foreign cherries appeared on the English market, and only one specimen of the pest was intercepted. There was accordingly no reason for the measures in force in 1932 to be amended to any material extent.

The Ministry's Horticulture Commissioner visited the cherry-growing districts of Italy in May, 1932: in consequence of the information gained during his tour it was decided slightly to extend the period during which cherries certified to have been grown in the Region of Emilia might be admitted. These were accordingly allowed to enter in 1933 up to June 16 instead of June 10 as in the two preceding years. No concession was made in respect of cherries grown in other parts of Italy, which were prohibited entry after June 5.

The importation of German cherries was prohibited after June 27, with the exception of those certified not to have been grown south of latitude 53° N. or in East Prussia.

1933 proved to be an early season for cherries, and it was found possible to begin sampling as early as May 15. A trace of infestation was found in French fruit on May 20; on May 23 two consignments were found to contain infested fruit to the extent of 5 per cent. and 10 per cent. respectively; further infestations ranging up to 16 per cent were discovered before importations ceased. Of the 29 consignments of French cherries examined during the season 4 contained infested fruit to the extent of 5 per cent. or over, 8 were slightly infested, and 17 were found to be free from infestation.

Twenty-six consignments of Italian cherries were examined between May 25 and June 13. Slight traces of infestation were found on May 26 and June 8, but with these exceptions no infested fruit was found.

1933 was the first year in which it was found possible to sample and examine Spanish cherries. A sample examined on May 22 was found to contain 2 per cent. of infested fruit and a 4 per cent. infestation was detected on the following day: the trade then ceased for some weeks but revived

EDUCATION AND RESEARCH REPORT.—III

towards the end of June. Infestations of 1 and 2 per cent. were found on June 29 and 6 per cent. on July 1. None of the 41 consignments of Spanish cherries examined during the season was found entirely free from infestation.

In all, 78 consignments of imported cherries were examined during the season; and, of these, 5 were found to contain more than 5 per cent. of infested fruit; in 20 the extent of the infestation was not greater than 5 per cent.; the remaining 53 were free from infestation.

Sale of Diseased Plants Order of 1927.—This Order prohibits the sale for planting of trees and plants substantially attacked by certain scheduled fungus diseases and insect pests, or which bear evidence of having been substantially attacked by the Apple Capsid (*Plesiocoris rugicollis*).

The effect of the Order in maintaining a high standard of health is demonstrated by the fact that although during 1933 the Ministry's Inspectors paid nearly 1,600 visits to nurseries, markets and auctions at which plants were exposed for sale, in no instance was it necessary to take action under the Order.

Silver Leaf Order of 1923.—This Order requires that all dead wood of plum or apple trees must be removed and burnt before July 15 in each year.

The existence of the disease was reported somewhat more frequently during 1933 than in the preceding year, but a large number of the reports related to private gardens.

During the course of the year 1933 more than 800 visits were made by the Ministry's Inspectors acting under this Order. In no case was it necessary to resort to legal proceedings against occupiers for failure to carry out the requirements.

During the early months of the year a special campaign was arranged in conjunction with the Department of Horticultural Education of the Norfolk County Council and was carried out in the important fruit-growing areas around Upwell and Outwell. Lectures on the disease were given and about 100 orchards were visited. In no instance was any large quantity of infective material found; growers

EDUCATION AND RESEARCH REPORT.—III

generally were glad to have any sources of infection pointed out to them and to learn how the disease spreads.

Bulb Diseases (Isles of Scilly) Orders of 1923 and 1924.—These Orders, which were made at the request of the bulb growers of the Scilly Isles with the object of preventing the introduction of eelworm and other pests and diseases of bulbs, prohibit the entry of daffodil and narcissus bulbs into the Islands unless they are (1) officially certified as healthy, or (2) subjected to the warm-water treatment before shipment, or (3) consigned to the Bulb Treating Station at St. Mary's, there to be submitted to the warm-water treatment before they are handed over to the ultimate consignees.

During the year 1933, 5 licences were issued authorizing the consignment of daffodil and narcissus bulbs from England to the Bulb Treating Station at St. Mary's; 34 consignments were examined and certified as healthy.

Onion Smut Order of 1921.—This Order prohibits, *inter alia*, the planting of onions or leeks in infected soil except under licence. For the past few years it has been the practice of the Ministry to refuse to issue such licences save in exceptional instances in which the concession is likely to involve little serious risk of spreading the disease. The effectiveness of the Order in preventing the spread of the disease is demonstrated by the fact that only two fresh cases have been discovered since 1931. Only twenty outbreaks of Onion Smut are known to the Ministry to have occurred in England and Wales; these are distributed as follows:—Northumberland 10, Durham 2, Westmorland 1, Lancashire 1, Worcester 2, Northampton 2, Huntingdon 1, Suffolk 1.

Orders Administered by Local Authorities.—The Orders described in this section were made at the request of the Local Authorities concerned in order that they might have powers to deal with complaints from growers in their districts that diseases and pests were re-infecting their orchards from neighbouring plantations. It will be seen from the particulars given that the existence of the Orders has had a salutary effect.

During the early part of 1933, the Ministry examined the question of the steps to be taken to assist fruit growers who

EDUCATION AND RESEARCH REPORT.—III

were endeavouring to improve the quality of the fruit produced in their orchards. It is obviously unjust that a grower should spend time and money in the practice of up-to-date and scientific methods of orchard hygiene to no effect, owing to the presence of infected orchards in the vicinity. The Ministry decided, in the light of the experience gained in working the Black Currant Mite (Norfolk) Order of 1928, and of the West Norfolk and Wisbech District Fruit Tree Pests Orders of 1931, that it would be of advantage if similar Orders were brought into operation in the chief fruit-growing districts of the country, provided that the majority of fruit growers in the districts concerned were in favour of this procedure. A circular letter was therefore sent to fifteen County Councils calling their attention to the Orders mentioned above, and suggesting that they might like to consider whether a similar Order would serve a useful purpose in their own districts. It was pointed out in the letter that the issue of these Orders does not represent any attempt on a national scale to control any specific pest: the Orders were designed, in effect, to give Local Authorities powers to require the abatement of nuisances. As a result of the circular it is probable that Orders will be made applicable to a number of counties.

Black Currant Mite (Norfolk) Order of 1928.—This Order, which is effective within the Administrative County of Norfolk and the County Borough of Great Yarmouth, enables officers appointed by the Local Authority for the purposes of the Order to investigate cases in which growers of black currant bushes complain that bushes growing on other premises within the district are likely to cause "Big Bud" to spread to their own bushes. If the Local Authority are satisfied that the complaint is justified, the owner of the affected bushes may be required to cut down and destroy all affected branches, or to treat the bushes in a prescribed manner. The Ministry is informed that no complaints were received by the Local Authority during 1933 and no action under the Order was therefore necessary.

Fruit Tree Pests (West Norfolk) Order of 1931.—This Order, which is effective within the more important fruit-growing area of, West Norfolk in the Petty Sessional Divisions of Freebridge Marshland and Clackclose, follows the main lines of the Black Currant Mite (Norfolk) Order of 1928. It enables officers appointed by the Local Authority for the purposes of the Order to investigate within the scheduled district cases in which growers of fruit trees complain that fruit trees growing on other premises within the district are likely to cause the spread to their own trees of the following diseases or pests:—fruit tree cankers, brown rots, apple and pear scab; fruit tree aphides, apple sucker, winter moth, codling moth, fruit tree capsid bugs, and fruit tree red spiders. If the Local Authority are satisfied that the complaint is justified, the owner of the affected trees may be required to cut out and burn all affected branches or to treat the trees in a prescribed manner.

The Ministry is informed that during 1933 notices were served on 15 occupiers requiring them to spray affected trees. Fourteen occupiers

EDUCATION AND RESEARCH REPORT.—III

duly complied with the requirements of the notices; in the remaining case the occupier cut down and destroyed the affected trees.

Fruit Tree Pests (Wisbech District) Order of 1931.—This Order is operative within the important fruit-growing area in the Isle of Ely, adjoining that in which the Fruit Tree Pests (West Norfolk) Order of 1931 is operative, and is in similar terms to that Order. The Ministry is informed that no action under this Order was taken by the Local Authority during 1933.

Apple Capsid (Essex) Order of 1932.—This Order was made at the request of and is administered by the Essex County Council, and does not entail action by officers of the Ministry. It is operative within the administrative county of Essex, including all the County Boroughs and Boroughs.

The Local Authority asked for the Order to be made on the grounds that the apple capsid (*Plesiocoris rugicollis*) was believed not to exist in Essex, and the fruitgrowers in the County were anxious that every possible step should be taken to prevent its introduction.

The Order requires any person, other than a private grower as defined in the Order, who receives any apple trees or gooseberry or currant bushes for planting, or for sale for planting, to notify the fact to the Local Authority. Officers appointed by the Local Authority are empowered to enter any premises in the district and examine any apple trees or gooseberry or currant bushes, and the Local Authority on being satisfied that the apple capsid exists on any such trees and bushes may require the occupier to carry out any prescribed treatment.

After the Order had been made, the apple capsid was found to exist in four parishes, and the Ministry is informed that during 1933, notices were served on 19 occupiers requiring them to treat their trees in a prescribed manner.

The experience gained during the first twelve months of the operation of the Order convinced the Local Authority of the desirability of receiving notification of the receipt of scions, cuttings or other woody parts of apple trees or gooseberry or currant bushes for propagation or for sale for propagation—these were not included in the original Order. Application was made to the Ministry for the necessary authority, and this has been given by the Apple Capsid (Essex) (Amendment) Order of 1934 which came into force on March 19, 1934.

Wart Disease of Potatoes Order of 1923 : (a) Spread of Infection.—The number of parishes outside the main infected area in which wart disease was recorded for the first time in 1933 was 11 as compared with 20 in 1932 and 24 in 1931. The first outbreak was recorded on July 7, i.e., eight days earlier than in the preceding year. In most cases there appeared to be little doubt that the outbreak was due to previous contamination of the soil; in cases where there appeared to be any ground for suspecting the seed, arrangements were made, where practicable, for the examination of crops grown on other land from the same seed; in no instance, however, could any of the outbreaks be attributed to seed infection.

(b) Infected Areas.—21 new outbreaks were reported in 1933 from parishes within the infected areas. This is the

EDUCATION AND RESEARCH REPORT.—III

lowest number on record for any one season, and compares with 37 in 1932 and 94 in 1931. As in previous years, special attention has been given to the potato crops grown in districts bordering on the infected areas, but there has been no reason to consider any extension of the boundaries of those areas.

(c) *Certification of Potatoes.*—The Order requires all potatoes used for planting in England or Wales (except "own saved" seed) to be the subject either of a Clean Land (C.L.) or True Stock (T.S.) certificate, the number of which must be quoted in all transactions in seed potatoes. Clean Land certificates can as a rule be issued from the Ministry's offices immediately on the receipt of the application, but in cases where a district within or bordering on the infected area is involved, the crop must be inspected before the certificate can be issued. True Stock certificates are issued only in respect of varieties that have been approved by the Minister as being immune from wart disease. Inspections for these certificates are dealt with in the section on the inspection and certification of growing crops (see pp. 885-88).

Particulars of the certificates issued under the Order during the past three years are as follows:—

		1931 <i>crop.</i>	1932 <i>crop.</i>	1933 <i>crop.</i>
<i>Clean Land.</i>				
No. of certificates issued ..		5,291	3,857	3,863
Acreage		64,558	58,917	57,247
<i>True Stock.</i>				
Acreage certificate		2,309	3,395	3,866

It was mentioned in the last Report that licences had been issued under Art. 11 of the Order authorizing the planting during 1933 of some 50 tons of Dutch potatoes of a variety claimed to be specially suitable for the manufacture of "potato crisps." The crops grown from this seed were examined by the Ministry's Inspectors during the growing and lifting season, and were found to be generally healthy and free from disease. Licences were issued authorizing the planting during 1934 of some 250 tons of Dutch seed of the same variety.

Since the date of the last report, legal proceedings have been taken in respect of the following contraventions of the Order:—

(1) For failing to furnish the buyer of seed potatoes with a statement identifying the certificate relating to the potatoes sold (2 cases). The Defendant pleaded guilty, and was fined £3 in each case.

EDUCATION AND RESEARCH REPORT.—III

(2) A similar charge against another Defendant, who pleaded "Not guilty." The Magistrates stated that they had no doubt about convicting, and inflicted a penalty of £2.

Wart Disease of Potatoes (Amendment) Order of 1929.—This Order was made with the object of providing an additional safeguard against the appearance of wart disease in the areas around Boston and Wisbech, in which are grown most of the potatoes intended for export purposes. The Order is operative within a district comprising the administrative County of Lincoln (Parts of Holland) including the Borough of Boston, the Petty Sessional Division of Wisbech and the Borough of Wisbech (Isle of Ely) and the Petty Sessional Division of Freebridge Marshland and the Borough of King's Lynn (Norfolk). Within this district it is forbidden to plant, in allotments not exceeding $\frac{1}{4}$ of an acre in extent and in private gardens, any potatoes except certified stocks of approved immune varieties. No restrictions are, however, placed on the planting of potatoes of immune varieties saved from the crop grown on the same land in the previous year, or of the following five early varieties which are not immune from the disease:—"Sharpe's Express," "Eclipse," "Epicure," "May Queen," and "Duke of York."

The reports of the inspectors engaged in the district affected by the Order show that the publicity given to its provisions by the Local Authorities concerned, coupled with the warnings given by the Ministry in cases where contravention of the regulations had occurred in previous years, have resulted in securing a far more general observance of the requirements of the Order during 1933 than had been attained in previous seasons during which it had been in operation. No legal proceedings were taken.

Wart Disease Immunity Trials.—The testing of new varieties of potatoes for immunity from wart disease was carried on in 1933, as in previous years, under the supervision of the Ministry, at the Potato Testing Station of the National Institute of Agricultural Botany at Ormskirk, Lancashire. The results of the trials were co-ordinated with those obtained at Philpstoun and Kilkeel by the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland respectively. The findings of the Potato Synonym Committee of the National Institute of Agricultural Botany are accepted by the Ministry where

EDUCATION AND RESEARCH REPORT.—III

recommendations as to the classification of new varieties are made by that Committee.

In 1933 the number of stocks included in the second and subsequent years' tests was 40, none of which developed wart disease. Of the 48 entries for the first year's tests 5 became infected in the field, 3 proved to be synonyms of existing varieties, 2 were too poor to judge and 43 were distinct varieties. Twenty-six new varieties were recommended for approval as the result of the 1933 trials, but only 2 of these have actually been added to the approved list. In order to avoid the publication of the names of varieties of which stocks may not be available it is the practice of the Ministry to defer the addition of any new varieties to the approved list until such time as the raisers have intimated that the varieties have actually been, or will shortly be, introduced into commerce.

Horticultural Education.—Previous reports have given detailed accounts of the facilities provided by county education authorities in the way of advice and instruction on horticultural matters; examples have also been given of the work carried out by the horticultural staffs employed by these local authorities. In the past year the demand for the services of these officers has continued to increase; a large part of their activities has been devoted to assisting new growers who have been attracted to horticulture by the opportunities for increased production presented by the protection now given to the home grower. Increased interest is now being taken in the intensive cultivation of crops in glasshouses; in Hertfordshire, Cheshire, Durham and Lancashire glasshouse units have been established by the local authorities for the purpose of demonstrating the cultivation of such crops on a commercial basis; in Norfolk, Hampshire and Lincolnshire demonstrations in the cultivation of fruit and vegetable crops in frames (a branch of horticulture which has not been previously practised on a large scale in this country) are receiving attention. Another notable result of the tariff policy has been the widespread interest taken in the growing of mushrooms; a very large number of inquiries have been received by the Ministry on this subject, mainly from the smaller domestic horticulturists. The demand for the Ministry's Bulletin on "Mushroom Growing" has been exceptionally keen, and it was necessary to obtain a fourth reprint of the second edition.

A special feature of horticultural education in recent

EDUCATION AND RESEARCH REPORT.—III

years has been the organization of demonstrations in fruit spraying technique in districts where fruit growing is an important industry. Since the war this question has been the subject of experiments and investigations at the Fruit Research Stations; it may fairly be stated now, that for most fruits there have been devised spraying programmes that are capable of effective control of the principal diseases and pests, and that have made it possible for growers to produce clean high-quality fruit. There is, however, a wide difference between farm and experimental conditions, and as a test of spraying operations on a commercial scale, the Ministry in 1932 arranged with the Kent County Council to carry out a spraying demonstration on a farm at East Farleigh, near Maidstone, where the conditions were regarded as more than usually difficult. A report of this demonstration, with details of costings, was given in an article which appeared in this JOURNAL for August, 1933.

Bulletins.—The preparation of Bulletins dealing with the cultivation, diseases and pests of special crops or group of crops was continued during the year and the following were issued:—Commercial Bulb Production; the Cultivation of Vegetables in Frames; a Brief Summary of Vegetable Diseases; Onions and Related Crops; Manuring of Vegetable Crops; and the Cultivation, Diseases and Pests of Tomatoes.

Crop Reports.—Reports on the condition of fruit, vegetable and flower crops in areas where such crops are grown to an appreciable extent for market, have been issued at regular intervals. These reports are based on information furnished by the Ministry's horticulture inspectors, and from May to September relate to the chief fruit and vegetable crops; from October to April they are confined to flower and vegetable crops of seasonal interest. Forecasts of the probable yield of plums and damsons, cherries, gooseberries, strawberries, raspberries, blackcurrants, early cooking apples, and also of Worcester Pearmain, Bramley's Seedling, Cox's Orange Pippin and cider varieties of apples are issued at the appropriate periods of the season.

At its winter meeting the Horticultural Advisory Council appointed a small sub-committee of representatives of the National Farmers' Union, the National Federation of Fruit and Potato Trades Associations, the Horticultural Trades Association and the Food Manufacturers Federation to consider and advise the Ministry generally on the scheme of horticultural crop reports.

Inspection and Certification of Growing Crops. —The schemes for the inspection and certification of potatoes, strawberry plants and black-currant bushes were continued on the same lines as those followed in previous seasons. A new scheme, particulars of which are given below, was introduced early in the year for the inspection and certification of narcissus stocks.

The inspections under these schemes are conducted by selected members of the horticultural inspectorate during the growing season: these officers receive regular courses of

EDUCATION AND RESEARCH REPORT.—III

instruction and training in the identification of the varietal characteristics and disease symptoms of the crops with which they deal. For the services of the inspectors, fees are charged on scales calculated to ensure that the work is self-supporting. Certificates are issued in respect of crops that are found to be true to type and reasonably free from rogues, and, at the close of the respective inspection seasons, registers are issued giving the names and addresses of certificate holders for the information of prospective buyers.

The educational value of these schemes of inspection of growing crops is considerable. When the schemes for potatoes, strawberry plants and black-currant bushes were introduced some years ago few growers were able to identify more than a very limited number of the more common varieties of these crops, or were capable of detecting the presence of rogues, much less of identifying the particular varieties to which the rogues belonged. The inspectors engaged in examining a grower's stocks are able to impart information on these complex problems—information that has been readily assimilated by growers and has proved of much value to them. This development is most noticeable in connexion with the scheme for the inspection of strawberry plants, and is responsible to some extent for the decline in the number of applications under this scheme. It is essential that the standard of production should be maintained at the highest possible level, but this can only be achieved by planting reliable seed and young plants, bushes and bulbs. It is often therefore a penny-wise pound-foolish policy to neglect to take advantage of the facilities provided by these certification schemes, as the certificates, issued only after careful examination of the stocks by technical experts, imply a definite guarantee as to variety and purity.

Potatoes.—The system of inspection and certification of potatoes was commenced in 1918 in order to assist farmers to grow pure stocks of potatoes of varieties approved as immune from wart disease, for planting in soil infected with that disease.

The acreages of approved immune and other varieties of potatoes inspected and certified in each of the last four seasons are given in the following table:—

Year	Immune Varieties		Other Varieties	
	Inspected	Certified	Inspected	Certified
1930	2,485	2,235	2,273	2,063
1931	2,609	2,309	2,199	1,937
1932	3,956	3,395	2,931	2,605
1933	4,342	3,866	2,669	2,421

EDUCATION AND RESEARCH REPORT.—III

It will be seen that the total area inspected has steadily increased. The area inspected in 1933 was about 110 acres more than that dealt with in the previous year and some 2,250 acres more than in 1930. The increase in the area examined is almost entirely attributable to immune varieties; on the other hand, the area of other varieties has remained fairly constant.

The minimum standard of purity necessary to qualify for a certificate is 99.5 per cent. The acreage which reached this standard in 1933 represented about 90 per cent. of the total area inspected as compared with 87 per cent. and 88 per cent. in 1932 and 1931 respectively. A few well-known varieties account for the bulk of the area examined. In the immune section, over 72 per cent. of the total area in respect of which True Stock certificates were issued in 1933 is represented by the varieties Majestic (1,382 acres), Great Scot (926 acres), and Kerr's Pink (809 acres). Nearly 60 per cent. of the area in the susceptible section was represented by King Edward VII (1,445 acres).

Strawberry Plants.—Under this scheme stocks of strawberry plants, from which it is proposed to take runners for sale, are inspected with the object of their certification if found true to type and reasonably free from rogues. Certificates issued in respect of these stocks do not imply freedom from disease, but no stock is certified if it is obviously unhealthy or lacking in vigour at the time of the Inspector's visit.

Applications were received from 55 growers for the inspection of 143 acres of plants. This area was smaller than that of 1932 and 1931, when the number of applications was 80 and 111 and the acreage 162 and 217 respectively. As in previous years the bulk of the applications came from growers in the Wisbech area of the Isle of Ely, Lincolnshire, and Norfolk, and the remainder from various parts of the southern counties. The stocks of growers who were granted certificates in 1932 were inspected once only in 1933, at as late a date as possible (in July or early August), but other growers received in addition a preliminary visit in June.

The number of stocks and the acreage of each variety inspected during the past three seasons were as follows:—

Variety	1931		1932		1933	
	No. of Stocks	Acreage	No. of Stocks	Acreage	No. of Stocks	Acreage
Bedford Champion ...	20	8.5	3	0.6	3	0.4
Jucunda ...	4	4.4	1	0.5	2	0.4
Leader ...	9	2.2	2	0.4	1	0.1
Madame Kooi...	10	3.7	7	2.7	5	0.9
Madame Lefebvre ...	13	5.4	13	5.1	9	3.8
Oberschlesien...	57	63.5	48	57.8	25	26.7
Royal Sovereign ...	66	58.0	47	55.3	43	82.0
Sir Joseph Paxton ..	48	45.3	22	25.7	16	18.6
Stirling Castle ...	3	5.1	3	3.2	2	2.2
Tardive de Leopold ...	20	14.6	17	6.1	17	5.7
The Duke ...	8	3.4	9	4.1	7	3.4
The Laxton ...	10	3.4	3	0.7	3	0.4
	268	217.5	175	162.2	133	144.6

The outstanding features of this table are the increase in the acreage of Royal Sovereign—which regained its premier position and accounted for nearly 60 per cent. of the total acreage, and the decrease in the acreage of Oberschlesien by more than half that of the two preceding years.

EDUCATION AND RESEARCH REPORT.—III

Certificates were granted in respect of 141 acres of plants or about 97 per cent. of the total area inspected.

Black-currant Bushes.—Certificates for black-currant bushes are issued for stocks that are found on inspection to be true to type and apparently free from reversion. The scheme is confined to stocks of bushes two years of age and over. The normal procedure is to certify bushes as true to one of the four main group types, viz. :—(1) French Black, (2) Boskoop Giant, (3) Edina, and (4) Baldwin, and to insert in brackets any varietal names given by the applicants. Some varieties, however, have not yet been classified in any of these groups, and in these instances the stocks are certified true to variety.

Applications were received from 19 growers for the inspection of about 305,000 bushes; in 1932 there were 17 applications for nearly 282,000 bushes. The table below shows the number of bushes of each type inspected and certified during the past three seasons:—

	1931		1932		1933	
	Inspected	Certified	Inspected	Certified	Inspected	Certified
French Black ..	119,247	106,647	70,008	65,508	57,170	57,170
Boskoop Giant..	58,166	51,416	32,770	32,420	37,880	34,880
Edina ..	25,692	25,342	18,798	16,798	10,700	10,700
Baldwin ..	72,999	65,299	80,230	78,980	86,700	86,700
Unclassified Varieties ..	102,698	101,148	79,698	74,698	118,448	117,848
	378,802	349,852	281,504	268,404	310,898	307,298

The percentage of bushes certified (98) is the highest yet reached and compares with 95 per cent. in 1932, 92 per cent. in 1931, 81 per cent. in 1930 and 88 per cent. in 1929. Some 2,000 bushes were refused certificates owing to the presence of "reversion"; and 600 bushes were rejected owing to lack of vigour.

Bulbs.—The bulk of the bulbs needed for home flower growing are imported, and with the expansion of flower cultivation both commercially and in private gardens, first in the open and later under glass, the volume of imports increased enormously and amounted in 1932 to 750 million bulbs valued at about £1,470,000, of which about 90 per cent. was Netherlands produce. The increasing demand for British-grown bulbs, and the effects of the recent financial depression, focussed attention on the possibilities of developing this industry in England and Wales, and behind the shelter of a protective duty on imported bulbs growers were encouraged to meet this demand.

English bulb growers have devoted their attention chiefly to the production of cut flowers, either forced or out of doors; comparatively little attention has been paid to "dry" bulb production. In order to assist this industry to develop along the right lines the Ministry approved a

EDUCATION AND RESEARCH REPORT.—III

scheme of experimental work to be carried out at the Kirton Agricultural Institute and Experimental Station of the Holland (Lincs) County Council; and an assistant for bulb investigation work was added to the staff of the Institute. The main object of the investigation (which began late in 1931) has been to find out the best methods of producing bulbs that will be equal in size and appearance to those imported. Several experimental beds of different varieties and kinds of bulbs have been laid down at the Institute to ascertain, *inter alia*, the effect (1) of planting bulbs of various sizes at various depths; (2) of planting bulbs of various sizes; (3) of manuring of bulbs; (4) of careful and careless handling; (5) and of cutting the flowers as against non-cutting or removing flowers only. These investigations, which are still in their infancy, have already produced data most useful to growers who intend to devote a portion of their land to the production of bulbs.

As with other horticultural crops, it is important that bulbs intended for sale should be true to name and reasonably healthy; and after consultation with bulb growers, forcers and others, the Ministry early in 1933 introduced a scheme for bulbs, which provided for the inspection of the foliage and flowers of growing stocks of narcissi with the object of their certification if found to be true to type and reasonably healthy. Details of the operation of this scheme are given below:—

Applications were invited for the inspection of the twenty principal commercial varieties of narcissi; at the same time, and in order to attract raisers of less known and new varieties, special arrangements were made for the examination of other varieties. The last dates for the receipt of applications were as follows:—Scilly Isles, February 20; Cornwall, Devon and Somerset, March 1; other districts March 15.

Twenty-nine applications were received, more than half of them being from growers in the Scilly Isles, Cornwall and Devon; the total area involved was approximately 98 acres.

The most prominent varieties submitted for examination were Golden Spur (18 acres), Emperor (11 acres), King Alfred (9 acres), and Sir Watkin (9 acres), followed by smaller areas of Bath's Flame (6 acres), Victoria (6 acres) and Poeticus Recurvus (5 acres).

The standard of purity necessary to qualify for a certificate is 99.5 per cent.; stocks containing more than 5 per cent. of weak plants or having dwarfed or distorted foliage, and plants failing to appear above ground (i.e., misses) were regarded as lacking in vigour and were rejected; stocks infected with eelworm exceeding 1 per cent. throughout also failed to qualify for certification. Ninety-three acres, or approximately 95.4 per cent. of the area examined, were certified. It is of interest to note that the presence of rogues exceeding the limit of 0.5 per cent. was responsible for the rejection of only $\frac{1}{2}$ acre of plants; $2\frac{1}{2}$ acres were refused certificates owing to lack of vigour; and $1\frac{1}{2}$ acres failed to qualify owing to eelworm infection.

EDUCATION AND RESEARCH REPORT.—III

Many of the growers who submitted applications have already established for themselves a high reputation in the bulb industry, and the percentage (95) of the stocks certified reflects in some measure the care and attention devoted to the technique of bulb production by those growers. Two practices of importance were found to be common amongst the applicants for inspection:—

- (1) The warm water treatment for the control of eelworm.
- (2) Rogueing of the growing crop for purity and also in some instances for disease.

Trials of Hardy Fruits for Commercial Purposes.—

The scheme for the testing of new varieties of fruit trees, which is conducted by a joint committee of representatives of the Ministry and the Royal Horticultural Society, has now been in progress 10 years. The scheme, which covers both top and bush fruits, involves the testing of varieties submitted for trial at the Society's gardens at Wisley in the first instance; varieties that show sufficient commercial merit are later sent for further tests to the sub-stations named below:—Long Ashton (Somerset), Merton (Surrey), Perdiswell (Worcester), Osgodby (Yorks), Wisbech (Isle of Ely), Emneth (Norfolk), Saltash (Cornwall), East Malling (Kent), Houghall (Durham), and Cambridge.

These trials have proved of great interest to breeders of fruit, who have submitted for testing no fewer than 110 varieties of apples, 9 of pears, 22 of plums and damsons, 9 of cherries, 21 of red currants, 18 of gooseberries, 51 of raspberries, and 50 of black currants. The early plantings of top fruits are now cropping, and valuable data as to the performance of some of these varieties, their susceptibility to scab and the effects of pollination have been collected. The 1933 season was marked by variable results at Wisley and at the sub-stations, owing in the main to severe frosts in spring and to the unusually dry summer. Almost all "top" fruits suffered considerable frost damage; the damage to soft fruits, however, was not so severe, and cropping was satisfactory except for certain varieties of gooseberries and "Baldwin" black currants.

The trials of bush fruits naturally give quicker results, and, for some varieties, the tests have already been completed. A brief account of the results of the trials of black currants, raspberries and red currants was given in an article published in this JOURNAL for April, 1933.

A very large number of varieties of strawberries have been received for testing; many of these have been eliminated as unsuitable for wide commercial planting, and several instances of synonymy were also discovered. The collection under trial now includes 52 varieties; of these Royal Sovereign remains the best of the early ripening varieties, followed by Oberschlesien and Sir Joseph Paxton, with Tardive de Leopold as the best of the late strawberries. The usual difficulties experienced by growers in obtaining healthy stocks of strawberries have also been encountered at Wisley, but they have been overcome to a large extent by adopting a high standard of cultivation and especially by selective propagation of healthy stocks, and by restricting the number of runners on each plant. Through these methods healthy, fruitful stocks of most varieties have been maintained, and reasonably satisfactory control over such pests as the tarsonemid mite, red spider and strawberry aphid has been secured.

EDUCATION AND RESEARCH REPORT.—III

Nuts and several kinds of blackberries are also included in these tests, and several varieties of different kinds of soft fruits are sent annually to the Fruit Preservation Research Station, Chipping Campden, where their canning qualities are tested.

Export of Plants, etc.—This country has an appreciable volume of trade in the export of nursery stock, plants, bulbs, potatoes, etc., and in order to enable exporters to comply with the regulations of the importing countries the Ministry undertakes the necessary inspection and certification of the produce before shipment.

Nursery Stock, Bulbs, etc.—Particulars of the certificated consignments of nursery stock, bulbs, etc., during the past three years, and of the number of certificates (including Phylloxera certificates) issued, are as follows:—

<i>Year.</i>		<i>No. of Certificates.</i>		<i>Value of Consignments.</i>
1931	..	5,346	..	£ 49,670
1932	..	4,891	..	33,348
1933	..	4,211	..	27,108

The total consignments certified for export in 1933 included bulbs valued at £3,800, manetti stocks valued at £2,400, and orchids to the value of about £8,000.

Potatoes.—The export of potatoes, mainly seed, from this country is a trade that fluctuates from year to year; in 1933 the volume of exports (25,056 tons) was the lowest for many years, whilst the estimated average price per ton in 1933, namely £3 8s., was more than £2 per ton less than the average price for the previous five years. Details of the quantity and value of potatoes certified for export in each of the years 1930-1933 are as follows.—

<i>Year.</i>		<i>Tons.</i>		<i>£</i>
1930	.	27,675	..	121,241
1931	..	25,949	..	147,882
1932	..	33,048	..	187,098
1933	.	25,056	..	85,937

In 1933 some 14,850 tons of seed potatoes were sent to Spain and Algiers; 7,200 tons of ware and 900 tons of seed were consigned to South America; the remainder went to the Canary Islands, Portugal, Morocco, France, and Italy.

MARKETING NOTES

Milk Marketing Scheme: Pool Prices for October.—The pool prices declared by the Milk Marketing Board for October, the first month of the new contract period, are given below, with comparative figures for the preceding month, and the regional averages for the twelve months October, 1933, to September, 1934. The wholesale contract price (liquid milk buying price) in October was 1s. 4d. per gal. in all regions. The price in the preceding month was 1s. per gal. in all regions other than South-Eastern, where the price was 1s. 1d. per gal.

Producer-retailers' contributions for September and October are also given:—

Region	Pool Price (Pence per gallon)			Producer-Retailers' Contributions (Pence per gallon)	
	Oct.	Sept.	Average Oct. '33— Sept. '34	Oct.	Sept.
Northern	13½	10½	12.125	1½	1
North-Western	13½	10½	11.895	2½	1
Eastern ..	14½	11	12.375	1½	1
East Midland	14	10½	12.042	1½	1½
West Midland	12½	10½	11.562	2½	1½
North Wales	12½	10½	11.812	2½	1½
South Wales	13½	11	11.958	1	1
Southern	14½	11	12.375	1	1
Mid-Western	13	10½	11.771	2½	1½
Far-Western	12½	10½	11.647	3	1½
South-Eastern	14½	11½	12.854	1½	1½
Unweighted Average ..	13.55	10.82	12.042	2.03	1.20

Producer-retailers who did not sell milk by wholesale during the month otherwise than on contracts carrying level-delivery premiums were credited with a level-delivery premium of ½d. per gal.

The inter-regional compensation levy was fixed at ¾d. per gal. on all liquid milk sales, the whole of the proceeds being distributed among the regional pools in proportion to the quantities of milk sold in each region for manufacturing purposes. No general expenses levy was charged.

The estimated sales of milk under contract during October were 63,473,702 gal., approximately 4½ million gal. more than in September. 16,830,456 gal. went for manufacture,

MARKETING NOTES

the proportion to total sales being 26.5 per cent., compared with 26.6 per cent. in the previous month. In addition, milk manufactured into cheese on farms was estimated to amount to 1,199,866 gal., as compared with 2,773,752 gal. in September. Sales of milk for liquid consumption rose from 43,418,193 gal. in September to 46,643,246 gal. in October.

Retail Prices.—Reductions in the “ minimum appropriate retail price ” have been approved by the Milk Marketing Board for further areas. Approval may be given where the reduction is formally requested by the requisite majority of all the milk retailers in the area concerned, having regard to numbers and gallonage sold. More than 200 applications have been granted.

Pigs and Bacon Marketing Schemes.—*Bacon Pig Contracts for 1935.*—The date for lodging contracts for the sale of pigs to registered curers in 1935 was extended by the Pigs Marketing Board, with the concurrence of the Ministry of Agriculture and Fisheries, to November 20.

In order to overcome the difficulty that arose in the current contract period in supplying curers who depend largely on group contract pigs for their supplies, with pigs of the weights required, an important modification has been made in the form of group contract for pigs to be delivered in 1935. This modification gives the Pigs Marketing Board the right to require the producer to deliver his pigs in a heavier or lighter weight class than that for which they were contracted.

Insurance of Bacon Pigs.—The obligation to insure all pigs, which was included in the bacon pig contract in the first two contract periods, has been abandoned in the 1935 contract. The curer, however, undertakes to pay to the producer 1d. per score on all pigs delivered and accepted towards the cost of any insurance the producer desires to effect. Certain Insurance Companies have announced that they propose to issue to registered pig producers a policy, covering pigs delivered and accepted under contract, at a premium of 1s. 6d. per pig for full cover, or 1s. 2d. per pig for cover of the carcass, including the head but excluding other offals.

Price of Bacon Pigs for November.—The price of the “ basic ” pig (Class 1, Grade C) for November was 12s. per score, compared with 12s. 2d. for October.

MARKETING NOTES

Hops Marketing Scheme.—The Hops Marketing Board has announced that 157,591 pockets of the 1934 crop of hops have been consigned to the Board for sale. The total crop consigned to the Board last year was 127,258 pockets.

Committee of Investigation for England.—The Committee met on November 12 to consider a report made to the Minister (and referred by him to the Committee of Investigation) by the Consumers' Committee for England, upon a complaint of the Réunion des Gastronomes as to the operation of the Milk Marketing Scheme.

Reorganization Commission for Eggs and Poultry.—In consequence of the resignation of the Rt. Hon. Christopher Addison, M.D., M.P., from the Chairmanship and Membership of the Agricultural Marketing Reorganization Commission for Eggs and Poultry for England and Wales, the Minister of Agriculture and Fisheries has appointed Mr. F. N. Blundell, D.L., J.P., to be Chairman of the Commission.

Mr. Blundell has been a Member of the Commission since it was constituted in October, 1933, and was also a Member of the Reorganization Commission for Milk.

Regulation of Potato Supplies.—(a) *Home Produce.*—A scheme under the Agricultural Marketing Acts, 1931 and 1933, for the regulation of the marketing of potatoes produced in Great Britain came into operation in December, 1933. The scheme is designed largely to meet the special circumstances arising from the wide variation in the potato crop from year to year—due largely to factors outside the control of producers—and consequential fluctuations in prices. In the eleven years 1923-24 to 1933-34, the potato crop in Great Britain varied between $4\frac{1}{2}$ million and $5\frac{1}{2}$ million tons. In the same period, the average price per ton received by the grower varied between £8 7s. od. in 1924-25 and £2 6s. od. in 1928-29. Under conditions of unregulated marketing, therefore, potatoes are a very speculative crop.

In these circumstances, the most important of the powers conferred on the Potato Marketing Board by the marketing scheme are obviously those connected with the control of potatoes surplus to requirements for human consumption in years of heavy crops. The Board have power to exclude part of the crop from sale for human consumption by

MARKETING NOTES

determining either (a) the description of potatoes that may be sold (e.g., limiting sales to tubers of prescribed minimum marketable size), or (b) the quantity of potatoes that any producer may sell. Another provision of the scheme enables the Board to discourage over-production due to an increase in planting as distinct from an increase in yield.

By the use of these powers, it is hoped to introduce a measure of stability into the potato industry. The Marketing Board's efforts in this direction may, however, be stultified unless complementary action is taken to regulate the volume of imports.

(b) *Imports*.—Imports of potatoes into the United Kingdom have been regulated since September, 1933, by voluntary arrangements with exporting countries. Particulars of the arrangements have been noted in this JOURNAL from time to time. With the issue of the Potato (Import Regulation) Order, 1934,* under Section 1 of the Agricultural Marketing Act, 1933, the regulation of imports of potatoes has now been placed on a statutory basis.

The Order was made on October 29 last by the Board of Trade after satisfying themselves, as required by the Act, that the regulation of imports is necessary in order that the effective organization and development of the potato industry, under the Potato Marketing Scheme, can be brought about and maintained. The Order, which came into force on November 8 last, prohibits the importation of potatoes from any foreign country or from the Irish Free State except under licence.

The problems of machinery and procedure of regulation were exhaustively investigated by the Market Supply Committee, set up under Section 3 of the Agricultural Marketing Act, 1933, and a scheme, based on the Committee's recommendations, has been adopted, with the full support of producing and distributing interests. Imports will be regulated according to the available supplies of home-grown potatoes and the demand of the market. In years of heavy production, when home supplies are sufficient to meet the requirements of the market, imports of maincrop potatoes will be kept to a minimum, while in years when the home crop is small imports will be permitted to the extent estimated to be necessary to make good the deficiency. Adequate provision will be made for imports to meet the special demand for new

* S.R. & O., 1934, No. 1160.

MARKETING NOTES

potatoes in the early months of the year. By its nature the scheme is flexible and contemplates the determination of the permissible quantities of imports provisionally for three months in advance, the figure being adjustable monthly in the light of actual market experience. The quantities to be imported from time to time will be determined in the light of recommendations from the Market Supply Committee after consultation with the interests concerned.

The Order provides that the Board of Trade may license individual importers, and also an association of importers which may in turn issue to its members certificates having the validity of licences. The great majority of importers have in fact already become members of a specially constituted Potato Importers' Association, to which a general licence has been issued by the Board of Trade. The Association is managed by a committee of sixteen members, two of whom are nominated by the President of the Board of Trade after consultation with the Market Supply Committee, one by the National Federation of Fruit and Potato Trades Associations, and one by the Co-operative Wholesale Society. The remaining twelve members will be elected annually on a territorial basis.

The Potato Importers' Association will be responsible for allocating among its members the total quota that it is licensed by the Board of Trade to import. Allocations will be made on the basis of importations in a past period. Members must obtain a certificate from the Association in respect of each consignment and the certificates must be used within ten days of issue. Allocations remaining unused at the end of the month for which they were made may be carried over for not more than two months. Any member of the Association not requiring the full allocation granted to him for any month may transfer it wholly or in part to another member, provided he notifies the Association. Provision has been made to permit a share of the quota to be allotted to new importers.

Importers who are not members of the Association and who apply direct to the Board of Trade for import licences will also receive allocations in proportion to their shares in the trade in past years.

- In the case of main crop potatoes, it is not at present intended to prescribe the source from which importers should obtain the supplies which they are permitted to

MARKETING NOTES

import. With early potatoes, however, it will probably be necessary to make arrangements to ensure that total permitted imports in any season are obtained from exporting countries in prescribed proportions.

The Order does not affect potatoes imported for exportation after transit through the United Kingdom or by way of transshipment, nor does it in any way prejudice or modify the requirements of any sanitary Order made for the purpose of preventing the introduction of pests and diseases.

The address of the Potato Importers' Association is Russell Chambers, Covent Garden, London, W.C.2.

Potato Marketing Scheme.—At a meeting of the Potato Marketing Board held on November 1, Captain John Mollett and Mr. Alexander Batchelor were reappointed Chairman and Vice-Chairman respectively of the Board, for the ensuing year.

At the same Board Meeting, Mr. William Gavin, C.B.E., and the Hon. J. G. Stuart, M.V.O., M.C., M.P., were co-opted as members by the Board after consultation with the Market Supply Committee and with the approval of the Minister of Agriculture and Fisheries and the Secretary of State for Scotland.

All the members of the Board's Executive Committee were reappointed.

Regarding the remaining two Committees, six out of seven of the members of the old Committees were re-elected. Mr. J. D. H. Forbes, Jameston, Maidens, Ayrshire, a new member of the Board, was appointed to the Merchants Authorization Committee, and Mr. W. J. Reid, Fordhouse of Dun, Montrose, Angus, to the Basic Acreage Committee in place of Messrs. J. Gibb and W. Bruce.

The Board has issued its first list of authorized merchants. A supplementary list is being prepared for issue at an early date.

All registered producers and authorized merchants have been requested to furnish the Board with returns showing, by varieties, the stocks of potatoes remaining on hand on the night of November 10, and the quantities sold off farms up to the date of the return.

Wheat Act, 1932.—*Sales of Home-grown Wheat.*—Wheat certificates lodged with the Wheat Commission from the commencement of the cereal year on August 1 last up

MARKETING NOTES

to and including November 2, 1934, covered sales of 11,135,770 cwt. of home-grown millable wheat. The quantity sold in the corresponding period last year was 9,075,307 cwt.

First Advance on Account of Deficiency Payments.—The Wheat Commission has given notice of its intention to make a payment in advance to registered growers on account of deficiency payments that will become due under the Act for the current cereal year. This advance will be in respect of all proper applications received on valid wheat certificates delivered to the Commission on or before November 2, 1934. Payment will be made early in December, and will be at the rate of 3s. per cwt. Three further advance payments will probably be made during the cereal year on dates that will be announced in due course.

Milk Act, 1934.—Advances to the Milk Marketing Board under Section 1 of this Act to date total approximately £390,000. Details are given below. Section 1 relates to milk used for manufacture, but does not include milk used by the Board itself or milk used for cheese-making on farms. Provision for advances in respect of the latter categories of milk is made in Sections 2 and 3 of the Act respectively :—

Month in which milk was produced and manufactured	Gallons of milk used	Product	*Rate at which advances were made	Amount of Advance		
1934		Butter,		£	s.	d.
April	10,963,716	Cheese,	Varying	65,896	4	11
May	20,086,800	Milk Powder	from 1½d.	119,530	3	5
June	18,631,420	and Con-	to ¾d.	111,553	6	0
July	10,847,669	densed Milk	per	54,403	4	7
August	9,678,267	for Export	gallon	38,809	9	6
Total	70,207,872			£390,192	8	5

* Difference between the net cost per gallon to the purchaser of the milk or the cheese-milk price (whichever is the greater) and the standard price of 5d. per gallon for the summer months.

Belated claims relating to the later months may be expected to increase these figures slightly.

The Government of Northern Ireland has received a first payment of approximately £35,000 under Section 6 of the Act in respect of milk used for the manufacture of cream and butter at registered premises during the months of April, May and June, 1934. Payments under this section

MARKETING NOTES

are designed to secure to the respective milk producers a standard price of 5*d.* per gallon during those months. Details are as follows:—

Month of Manufacture	Gallons of milk used	Average Price paid by registered creameries per gallon	Equalization Payment per gallon	Advance		
		<i>d.</i>	<i>d.</i>	£	<i>s.</i>	<i>d.</i>
April	753,043	3·7	1·3	4,078	19	6
May	1,393,191	3·3	1·7	9,868	8	9
June	2,531,055	3·0	2·0	21,092	2	6
Totals	4,677,289	—	—	£35,039	10	9

Milk for Schools.—Although detailed particulars cannot yet be furnished, there is every indication that the number of children receiving milk in schools will be doubled as a result of this scheme. 18,000 schools have already registered with the Milk Marketing Board.

A point to be noted in connexion with the administration of the scheme is that since sales of Certified or Grade A (T.T.) milk, as such, are not controlled by the Milk Marketing Board, sales of designated milk to schools can only be recognized by the Board for the purposes of the scheme if the milk is sold as ordinary milk and at the uniform rate of 1*s.* per gallon (i.e., $\frac{1}{2}$ *d.* per one-third pint). Provided the producer is registered with the Board, the milk can then rank for subsidy under the scheme.

Cheese Milk Price.—The cheese-milk price for the purpose of Exchequer payments under the first three Sections of the Milk Act in respect of milk used for manufacture has been certified by the Minister to be 4·04 pence per pound for the month of November.

It may be noted that the same price was declared for October by the Milk Marketing Board for the purposes of paragraph 2 (1) of the Second Schedule to the prescribed form of milk contract, as the October cheese-milk price certified by the Minister, viz., 3·72 pence per pound.

Production of Home-grown Beet Sugar.—Returns furnished by the beet-sugar factories operating in Great Britain show that the total quantity of beet sugar manufactured during October, 1934, and the corresponding month in 1933 were:—

					<i>cwt.</i>
1934	..	..	..	..	3 087,077
1933	..	..	..	..	2,627,585

MARKETING NOTES

The total quantities of sugar produced during each manufacturing campaign to the end of October were:—

			<i>cwt.</i>
1934/35 campaign	..	..	3,633,927
1933/34	..	..	3,015,719

Conditions have been ideal for lifting and both yield and sugar content continue to be satisfactory.

Cattle Fund.—Up to November 20, payments aggregating £681,412 in respect of 287,890 animals, had been made under the Cattle Industry (Emergency Provisions) Act, 1934, an average of £2 7s. 4d. per beast.

National Mark Eggs.—The total output of the National Mark Egg Packing Stations for the three months July to September, 1934, was 114.5 million eggs, of which 94.6 million were packed under the National Mark, as compared with 96 million and 76.6 million, respectively, for the corresponding period of 1933. The following table shows the aggregate monthly output of the Stations during these periods:—

Month	1933			1934		
	Total output of Packing Stations (Fresh eggs)	Output under National Mark	Percentage of Total output under National Mark	Total output of Packing Stations (Fresh eggs)	Output under National Mark	Percentage of Total output under National Mark
	Millions	Millions	Per cent	Millions	Millions	Per cent
July	34.5	27.6	80	41.5	33.7	81
August	31.1	24.7	79	36.7	30.4	83
Sept	30.4	24.3	80	36.3	30.5	84
Totals for 3 months	96.0	76.6	80	114.5	94.6	83

National Mark Dressed Poultry.—A one-day course of instruction for County Poultry Instructors of table poultry was held by the Ministry on October 25, and was attended by 27 officers representing 19 counties in England and Wales. Visits were paid to the wholesale market at Smithfield, where supplies of English chickens were seen and the quality compared with that of imported supplies, and to representative National Mark poultry packing stations, one

MARKETING NOTES

of which specializes in the production and marketing of ducks, in Buckinghamshire and Hertfordshire.

National Mark Apples.—The forecast made in this JOURNAL for September, 1934, has been amply justified. Reports from all markets show that the quantity of apples packed under the National Mark this year is very much in excess of that packed under the National Mark in any previous season. An indication of the progress of the Scheme is that the new enrolments this season represent an estimated output of some 7,000 tons.

National Mark Fruit.—National Mark packers of apples and pears were again prominent among the prize-winners at the recent Imperial Fruit Show at Leicester. In the classes open to home-grown fruit, 35 first, 34 second, and 29 third prizes were awarded. Of these, National Mark packers succeeded in gaining 30 first, 29 second, and 25 third prizes. They also succeeded in gaining all the awards except one second and one third prize in the two classes in the British Empire Section, and in the two Empire championships for culinary and dessert apples. No fewer than 24 of the 36 Special Prize Awards for home-grown apples and pears were awarded to National Mark packers.

Quality of English Tomatoes.—During the past season an investigation was carried out into the quality of the English hothouse-grown tomatoes sold in the wholesale markets. A number of representative samples were obtained at different dates and were carefully examined as regards quality and freedom from blemish. The proportion of the examined fruit that was found to be up to the standards of the National Mark Scheme was not more than 70 per cent. While allowance must be made for the effects of the unusually hot season, the evidence points clearly to the fact that much remains yet to be done both as regards improved cultivation and the preparation and packing of the fruit for market.

The influence of cultivation on marketing problems is receiving the special attention of a Sub-Committee of the National Mark Fruit Trade Committee.

National Mark Perry.—In consequence of the demand by manufacturers for the extension of the National Mark

MARKETING NOTES

to perry, a Scheme has now been prepared with the co-operation of perry manufacturers and the National Mark Cider Trade Committee, and steps are being taken to bring it into operation at an early date. In its main essentials the Scheme follows the National Mark Cider Scheme, but provides for one grade only ("Select"), the definition of which prescribes that only the juice of perry pears may be used; the addition of apple juice or concentrated juice is not permitted. A limit is set to the quantity of syrup that may be added to the liquor in course of manufacture, and among other requirements it is laid down as essential that the finished product shall be free from acetic flavour and other disorders.

Manufacturers with an annual output of not less than 1,000 gallons of perry, or who are already enrolled in the Cider Scheme, will be eligible for enrolment in the National Mark Perry Scheme, copies of which will shortly be obtainable free of charge from the Ministry, together with forms of application for enrolment.

Fat Stock—Sales by Grade and Dead Weight.—During September and October, 1934, the Ministry's Scheme for the consignment of fat stock from farm to abattoir made considerable progress; 1,801 cattle, 3,598 sheep and lambs and 383 pigs were dealt with in the two months, as compared with 460 cattle, and 3,967 sheep and lambs during the same period of 1933. The total stock dealt with under the Scheme to October 30 comprised 9,412 cattle, 33,828 sheep and lambs and 1,147 pigs.

Of the 1,801 cattle received during September and October, 1,376 were certified for Cattle Fund payments based on dead-weight certification.

National Mark Stilton Cheese.—In recent years the number of makers of Stilton cheese, both in this country and abroad, has considerably increased. Insufficient attention given by makers to important technical points in the manufacturing and ripening processes has been responsible for quantities of poorly-finished cheese coming on to the market, and for the production of cheese bearing the same name but having marked differences in character. This situation cannot fail to detract from the prestige and good name built up over a period of years by the Stilton cheese industry. In the opinion of many makers and

MARKETING NOTES

distributors of high-class Stilton cheese, the introduction of national standards of quality and of a scheme for marking the graded produce under distinctive marks, should assist in restoring the reputation for quality formerly associated with the name of Stilton, and in widening the market for this cheese.

The National Mark Cheese Trade Committee, at its meeting on October 10, 1934, accordingly recommended the introduction of standard grade-designations and definitions of quality for home-produced Stilton cheese, and statutory effect will be given to these proposals in the Agricultural Produce (Grading and Marking) (Stilton Cheese) Regulations, 1934, which are now available in draft form. The proposed definitions include two grades (*Selected* and *Extra Selected*) for blue-veined Stilton, and one grade (*Selected*) for white Stilton. The Extra Selected grade must contain at least 50 per cent. of butter fat in the moisture-free substance, but for the two Selected grades a minimum of 45 per cent. is allowed. In each instance the cheese must be made only from full-cream cows' milk produced in England and Wales, and must satisfy certain requirements as to flavour, texture, appearance and colour. It is hoped that the scheme will be in operation in time for National Mark Stilton cheese to be on the market for the Christmas, 1934, season.

The authorized manufacturer will be responsible for grading and marking his own cheese, and for the application of National Mark labels combined with waterproof transparent covers. Quality control inspection will be undertaken by the Ministry. The National Mark labels, issued by the Ministry, on payment, will be blue for National Mark "Extra Selected" blue-veined Stilton cheese, red for National Mark "Selected" blue-veined Stilton cheese, and red and white for National Mark white Stilton cheese.

The scheme will require the authorized maker to insert on the National Mark label, in the space provided for the purpose, the date when the cheese is subject to deterioration and after which the guarantee of quality afforded by the National Mark will no longer operate. This date depends on the development of ripening at the time of grading and on the particular market for which the cheese is intended, e.g., for the hotel trade a fully-ripened cheese is demanded;

MARKETING NOTES

for private trade, a partially-ripened cheese only. The latter would bear an advanced validity date.

As an alternative method of applying the National Mark to cheese, the National Mark design may be incorporated in the design of a maker's private brand label, under licence issued by the Ministry. Private brand marks may be used in addition to official National Mark labels.

Marketing Leaflet No. 77, fully describing the scheme, is obtainable, free of charge, on application to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

National Mark Cheshire Cheese.—The National Mark Cheshire Cheese Scheme has now completed its first year of operation, during which it has been well supported by farm Cheshire cheese-makers and a number of factory manufacturers. The output of National Mark Cheshire cheese under the scheme up to Sept. 30, 1934, was as follows:—

I. FARM CHEESE

Quarter ended	No of factories submitting cheese for grading	No. of Cheeses Graded		
		Extra Selected	Selected	Total
31.12.33.	138	10,678	4,253	14,931
31. 3.34.	50	578	3,974	4,552
30. 6.34.	203	682	25,400	26,082
30. 9.34.	204	561	31,564	32,125
Total since the inception of the scheme to 30.9.34	248	12,499	65,191	77,690

II FACTORY CHEESE

15,401 Cheshire cheeses, weighing 6,625 cwt., were graded and marked in the same period on the premises of eight authorized manufacturers.

The past season has been one of excessive production, which has tended to flatten out prices to the disadvantage of the better-quality product.

It will be realized that the first year of the National Mark Cheshire Cheese Scheme coincided with the introduction of the scheme for the reorganization of the milk industry.

MARKETING NOTES

Generally speaking, as a result of the prevailing low prices, farm cheesemakers have been receiving a smaller return for their milk than neighbours who have sold their milk for the liquid market.

The Suitability of National Mark Wheat Flour for Bread-making.—Bread-making tests have been carried out at the National Bakery School with samples of National Mark All English (Yeoman) Straights flour milled from 1934 crop wheat and obtained from twelve different sources. The tests indicated that the general standard of quality of the National Mark flours submitted was higher than the standard of samples in previous years. Every sample tested was found to be satisfactory and capable of producing good commercial bread. The following observations have been taken from the Director's report:—

All the flours showed a greater uniformity, both as regards strength, colour and stability, than has been observed in any previous test of this nature.

All the flours produced doughs that gassed well and possessed a good fermentative tolerance for such flours.

Following the practice of last year, a short fermentation process of $2\frac{1}{2}$ hours was employed, using $4\frac{1}{2}$ lb. of salt per sack. All the loaves were baked on this shortened process, which proved satisfactory in every instance.

All the flours carried, with ease, 15 gallons of water per sack, and the doughs were possessed of remarkable stability. The doughs were easy to handle and in no case was there any tendency towards stickiness when they were scaled; there should be no difficulty in using this amount in commercial practice with flours such as were submitted this year.

All the bread possessed good volume, bloom and good crumb colour.

All the loaves sprang regularly in the oven, and the usual crusty break characteristic of English bread was completely absent this year. The oven spring resembled that produced from flour milled from mixed grists rather than Yeoman wheat alone.

Flour of this year's quality, owing to its good colour, could be used for many purposes in the bakery other than for bread; notably in the production of pastry, shortbread and cakes.

The flour used in the tests this year fermented well on a short process and produced bread with good keeping qualities. This is due entirely to the suitability of such flour for short processes.

Illustrations of the test loaves face page 906.

Copies of Marketing Leaflet No. 12E, giving the recipe for using National Mark flour in commercial breadmaking, may be obtained from the Ministry, free of charge.

MARKETING NOTES

Marketing Demonstrations.—The following displays have been arranged for December:—

<i>Exhibition or Show</i>	<i>Location</i>	<i>Date, 1934</i>	<i>Name of Exhibit</i>
Birmingham Cattle and Poultry Show	Birmingham	Dec. 1-6	Demonstration of meat marketing schemes.
Smithfield Fat Stock Show	Agricultural Hall, London	Dec. 10-14	do.
Home Pets Exhibition	Olympia, London	Dec. 12-14	National Mark Produce. Egg-grading. Demonstration.
Ashford Fat Stock Show	Ashford, Kent	Dec. 17-18	Demonstration of grade and dead-weight consign ment scheme for pigs.
Manchester Xmas Fat Stock Show	Manchester	Dec. 17-19	Demonstration of meat marketing schemes.

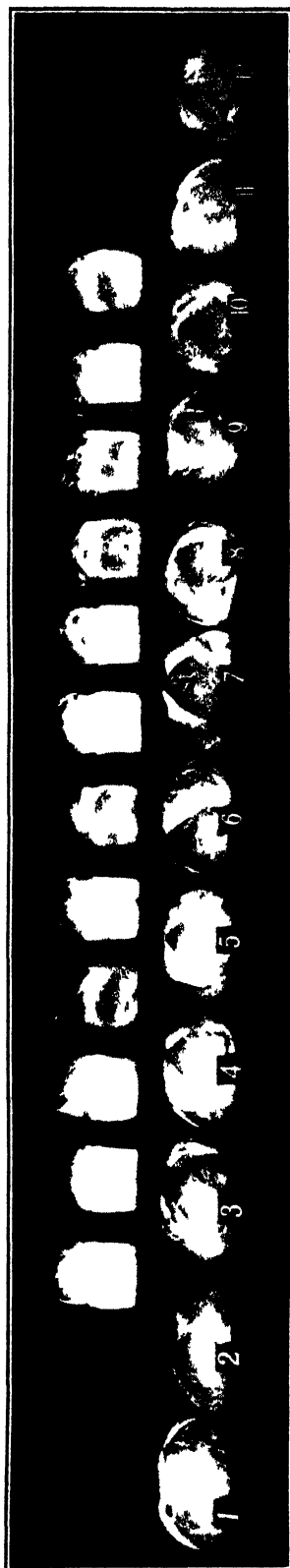
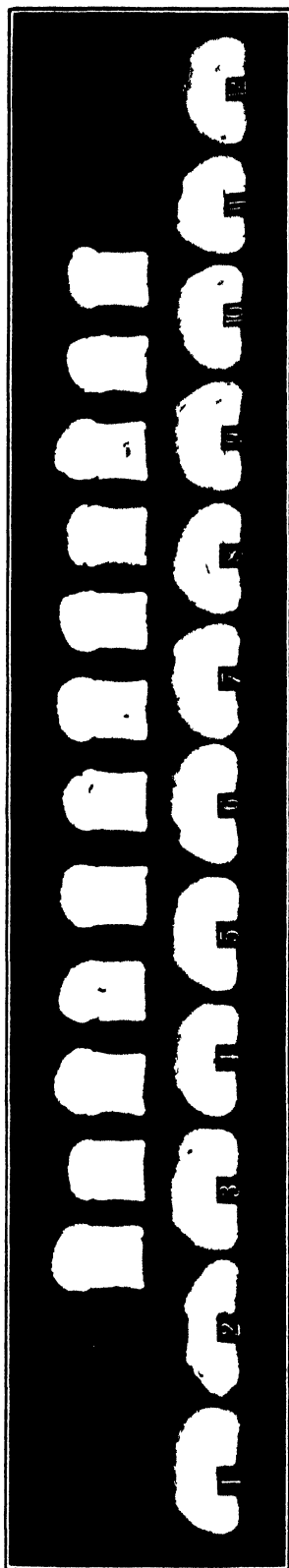
Irish Free State: Registration of Shops.—The Commission that was appointed by the Irish Free State Ministry of Industry and Commerce to inquire into the question of the registration of shops has recently reported. The majority of the Commission recommend a system of compulsory registration of shops, combined with compulsory licensing of retailers, but two members submit minority reports, dissenting from the majority view.

The dual nature of the proposals is designed to enable a distinction to be drawn between the part of a licence that should be purely personal, and the part that should attach to the business premises. The Commission point out that the proposed system of registration would enable the licensing authority to follow the practice that exists on well-managed estates—the segregation of shopping and residential areas. The system would also, by threat of cancellation or suspension of licences, permit a more efficient enforcement of sanitary regulations.

The system of compulsory licensing for retailers is recommended with the main objects—

- (a) of preventing the retail trade in the country, or any considerable portion of it, from coming under a control (e.g., that of non-national chain stores) that is not in the national or public interest;
- (b) of securing a measure of control over the manner in which the retail trade is conducted, where the interests of the general public are apt to be injuriously affected;
- (c) of protecting various legitimate interests of retail dealers themselves and of their employees; and
- (d) of preventing such an excessive multiplication of shops that the retail dealer could not afford to sell at a reasonable price, owing to the small ratio of turnover to overhead charges and expenses.

The Commission contemplate the automatic issue and renewal of licences to existing retailers, unless there is some good reason against it. Licences should, it is proposed, be more or less specific as to the class or classes of commodities that the licensee is permitted to sell, and such classification should conform to the Census of Distribution



Loaves in bread making tests carried out at the National Bakery School using samples of National Mark All English (Aceman) Straight's flour milled from 1934 crop when obtained from 12 different sources

MARKETING NOTES

that is already in preparation. It is suggested that a small fee should be charged, sufficient to cover the cost of a simple system of registration of premises, but not to provide a source of State revenue. The Commission assume that the administration of the system of registration and licensing would be entrusted to the Minister of Industry and Commerce, and they make no recommendations with regard to the inspection service that would presumably be necessary for the enforcement of the system.

The Commission propose that the issue of a new licence in respect of a shop that could only be expected to draw its custom from a limited area, should be refused if the licensing authority is satisfied that competition in the area is already sufficiently keen. This restriction of new licences would not affect the main shopping centres that draw their custom from a comparatively extensive area, nor would it apply to producer-retailers of home produce.

The Commission endorse the view that there are too many shops in the Irish Free State and that the multiplicity neither creates healthy competition nor tends to reduce prices. They consider that a substantial reduction in the number of shops, accompanied by supervision of prices by the Prices Commission, would assist towards material reductions in the prices of articles of general consumption. They also propose that the restrictions imposed on retailers under price maintenance agreements should not be binding unless the prices in question have been approved by the Prices Commission.

With regard to travelling shops, the Commission recommend that the restriction of new businesses should apply equally as to ordinary shops, with the exception that new licences should not be restricted in relation to travelling shops used only for the sales of baker's bread, fish, vegetables, fruit, flowers, ice cream or fuel. It is also proposed that the existing system of licences for the hawking and peddling (without travelling shops) of certain articles, namely, fruit, flowers and fuel, should not be disturbed. In defence of travelling (motor) shops, operating from ordinary shops as headquarters, evidence was given that these acted not merely as sellers of goods, but also as buyers of farm produce, particularly of eggs and fowls, a considerable number of van-owners being registered exporters.

Irish Free State: Agricultural Produce (Cereals) Act, 1934.—The Agricultural Produce (Cereals) Act, 1934, which was passed by Saorstat Eireann on September 13, 1934, extends considerably the Government's control of the cereal industry. Regulation is now extended to the sale of oats and barley and to the milling of oatmeal. The Act also provides for the production of flour compounded from wheat and oats, and for the restriction of the sale and use of wheaten flour. Provision is made for the warehousing and drying of grain by the State, and minor amendments are made to the Agricultural Produce (Cereals) Act, 1933 (a note on which appeared in this JOURNAL of August, 1933) and the Agricultural Produce (Cereals) (Amendment) Act, 1933.

Regulation of the Oats and Barley Trade and of the Milling of Oatmeal.—The main object of this regulation is the fixing of a minimum price for oats and barley, and the

MARKETING NOTES

Minister for Agriculture is empowered to lay down grades for home-grown oats and barley and to fix a minimum price for each grade. To implement this provision, all dealers in oats and barley and all millers of oatmeal are required to register in respect of the premises at which they carry on business and to keep records of their transactions. The premises and records are to be open to inspection, and returns may be required by the Minister. No miller and no registered maize or oatmeal dealer, who is not also a registered dealer in oats and barley, may purchase oats and barley other than from a dealer registered under the Act. This part of the Act was brought into operation on November 1.

Regulation of the Milling, Sale and Use of Wheaten Flour.—No Orders have yet been issued bringing the provisions under this head into operation, but the Minister for Commerce and Industry may issue such Orders whenever he thinks fit. The main purpose of these provisions is to extend the guaranteed market for oats. When the necessary Orders have been issued, it will be illegal, except under a special (occasional) licence, for millers to mill wheat into flour without the addition of a certain proportion of oat-kernels (to be specified in the Order) and millers will be required to keep records of the oats so used. For the purposes of quota under the 1933 Act, oat-kernels milled into this compound flour will count as wheat. Registered flour importers will then be forbidden, save under licence, to sell wheaten flour except to another registered importer or miller, and the Minister may require all persons other than registered flour importers or millers who have more than 28,000 lb. of wheaten flour in their possession to render returns of such flour, and millers may be required to purchase specified amounts of this flour at a price fixed by the Minister.

Wheaten flour may only be sold under licence and the sale of flour containing wheaten flour without also a specified percentage of oaten flour and/or milk powder may be prohibited. The Minister has power to lay down standards for milk powder used in the manufacture of this compound flour. The manufacture of bread, buns and cakes from wheaten flour, other than under licence, may also be prohibited, and any premises used for baking will be subject to inspection for the purpose of taking samples.

MARKETING NOTES

Warehousing and Drying of Grain by the State.—To meet difficulties of storage in the event of a bad harvest or wet weather, the Act provides for the acquisition of stores and kilns by the State. The Minister for Agriculture may by Order require the owners of grain stores and kilns to furnish particulars of their stores and kilns, which will be liable to inspection. With the consent of the Minister for Finance, he may acquire land compulsorily or by agreement for the purpose of erecting grain stores or kilns and may either undertake the business of warehousing or drying cereals in them, or may sell or lease the land and business to a private person for that purpose. All monies received by him will be paid into the Exchequer and at the end of the financial year he will report to the Irish Free State Parliament on his trading activities.

The chief amendment to the 1933 Acts is that which enables the Minister to vary the quota of wheat to be milled at each mill during the preliminary quota period. Another amendment relieves manufacturers of compound feeding stuffs of the duty of keeping records, but the feeding stuffs must now be labelled to indicate whether or not they are manufactured in the Irish Free State. Other amendments are framed to close loopholes in the principal Act or to provide for special cases, and the bulk of them relate to records, returns or penalties.

Germany: Regulation of Potato Marketing.—The issue of this JOURNAL for July last (p. 367) gave an account of the Order of April 10, 1934, regulating the marketing of early potatoes in Germany.

The marketing of maincrop potatoes is now subject to a similar system of control, as a result of orders and regulations issued on July 31, August 1 and August 14, 1934. Powers given to the Reich Food Office, and delegated by it to a Reich Potato Commissioner, enable the latter to issue regulations concerning the grading, marking, loading, conditions of sale and use of potatoes; to order the limitation of deliveries and loadings, and to make arrangements for the regulation of assembly and distribution; to forbid commission sales; and to fix prices and margins.

The marketing regulations issued by the Commissioner in virtue of these powers include the fixing of minimum prices, the compulsory use of standard forms of contract note, and the prohibition of commission sales.

The machinery of control used for early potatoes—viz., by area, district and local commissioners—has been retained for maincrop.

The Reich Commissioner fixes a minimum price for the cheapest varieties of eating potatoes, and area commissioners are authorized to fix higher minimum prices for the better varieties. No attempt has been made to control distributive margins. The maintenance of the

MARKETING NOTES

minimum growers' prices is assured through the compulsory use of standard contract notes, which are issued by the Reich Commissioner. One copy is held by the vendor and one by the purchaser, who is required to report the sale to the area commissioner within 3 days. The contract notes bear on the back some of the standard terms of sale; these have been printed in full in official journals. If the potatoes are resold wholesale, the purchaser is required to supply the vendor at once with a written receipt, retaining a copy; this must give precise details as regards quantity, type, price, etc. A receipt is not required in connexion with sales by retailers to consumers.

The standard contracts for the sale of eating potatoes include strict terms as regards grading and quantities. Purchasers by wholesale are responsible for seeing that the goods as bought conform exactly to the contract statements; it is not permissible to make up for deficiencies in the grades by price rebates.

Contracts for the sale of potatoes on commission, and the dispatch of truckloads of unsold potatoes are prohibited. All sales to wholesalers must be made according to the standard contract and at the fixed prices. Producers may continue to retail potatoes at weekly markets in quantities not exceeding 5 zentners (about 5 cwt.) in all, or 22 lb. per customer on any day; but the current retail prices must be maintained. Direct deliveries to consumers for winter storage are also permitted. All such sales must conform to the grading requirements. The hawking of potatoes is prohibited, as apt to undermine the price regulations. The practice, well established in certain districts, whereby households arrange for the digging of their own supplies from producers' fields, is still permitted, but prices must be consistent with the prescribed prices.

Potatoes, unless sold as eating potatoes, may only be sold under the designations of "seed potatoes," "fodder potatoes" and "factory potatoes." The arrangements for sales of seed potatoes will closely resemble those for sale of eating potatoes, as regards minimum prices and standard contract notes. Potatoes sold for fodder purposes may only be sold under the designation "fodder potatoes," and even if graded after sale, they may not be resold as eating or seed potatoes.

DECEMBER ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington.

CHANGES in agricultural production have done much to disturb the former association of seasons with particular practices. This is especially true of live stock, in relation to which continuity and regularity of production are introducing new features and giving to the farm in winter an air of activity that was at one time rarely seen. December provided a possible exception, for the Christmas fat stock shows and markets have assumed an importance that is the outcome of the combined efforts of breeders and feeders to satisfy the seasonal needs.

The modern fat stock show is used to illustrate the progress that has been realized by breeders and feeders alike. The scientist is able to explain with a fair degree of accuracy how far breeders have made real progress, and in what direction further developments are possible. It is not altogether easy to separate the respective influences of breeding and feeding, but our knowledge of meat production has been aided greatly by the work of Hammond at Cambridge. Arising out of these studies, it has been possible to define a good beef-producing animal as one that is well-developed for its age. This requires some qualification, however, for mere weight for age is apt to be misleading, if the weight is wrongly distributed on the body of the animal. Modern investigations seek to determine the factors that influence this proportional development. A calf at birth is found to be nearly all legs and head, with a comparatively undeveloped back, loin and buttocks. With increase in age the body develops and the legs and head assume relatively less importance.

Selective principles of breeding have been employed by breeders in the development of modern types. In this respect the breeding of animals intended for meat production has been straightforward. The butcher has been able to define his needs, and breeders, largely by the aid of the eye, have been able to select a type that conforms to these requirements. The butcher lays emphasis on the development of those parts of the animal's body that he can sell most readily—the quarters, loin and ribs—and on the

limitation of offal, to which end coarseness of bone, and largeness of belly are detrimental.

It is sometimes suggested that the farmer is not compensated adequately for concentrating upon quality in the course of production. This presumes that it is more difficult to satisfy the higher standards and that there is a reduction in output. This is no reason, however, why one should rest satisfied with things as they are, for once quality is generally appreciated, it sets the standard of production—a factor that has been quickly realized in the case of bacon-pig type within the last year and a half. It is being appreciated increasingly that management and feeding have a dominating influence on breed type, apart from selection. Strain may count for much, but quality of flesh and proportional development are often controlled by management. This, in part, explains why feeders generally are not now disposed to attempt too much "storing" of cattle, since this tends to maintain the characteristic conformational features of the calf stage, so that when such animals are mature they are distinguished by a greater development of the undesirable qualities.

There is, therefore, an economic significance in studying quality, while the earlier and continuous feeding that is now common indicates the extent of the feeders' desire to meet the public demand. There are some contradicting features, however, even in fattening. The demand is not only for a relatively young animal that is full of lean flesh, but the lean must be associated with the correct proportion of fat. It is explained that roasting of meat is the most popular method of cooking in this country, and that a good roast can only be secured when a joint possesses associated fat to preserve the flavour and juiciness of the meat. This is the reason why the butcher appreciates proper "finish," and why in certain instances the "baby beef" animal is not regarded as the ideal meat beast.

The Elimination of Waste.—The extent to which waste interferes with farming profits is perhaps not sufficiently appreciated. Some consideration of this question may result in an improvement in farming efficiency and returns. There are circumstances in which waste is beyond the farmer's certain control, particularly when it is the result of attacks of insect pests or disease, though even here loss may be very heavily reducible.

DECEMBER ON THE FARM

The main sources of waste may be in respect of labour and foodstuffs. It may be argued that the economic condition of the industry exerts an effective check on waste in these directions, but costing surveys indicate that there is still a great difference in the efficiency of farm labour and in the economy of feeding live stock. Efficiency of farm labour is largely within the control of the employer, and no farmer can afford to neglect the problems affecting the use of labour in relation to efficiency. Punctuality is expected of all labour in these days of fixed hours and rates of pay based on hours worked. This has been responsible for the industrializing of farm labour on many large farms to such a degree that clocking-in machines are now sometimes in use. It is often possible for a man to be punctual in his hours and yet to waste time for lack of a well-planned programme of work. This is where it is essential to realize the importance of planning ahead, and to have alternatives available when one job is completed or when bad weather intervenes.

The proper organization of farm labour is only possible when an experienced mind is brought to bear upon the problems, and yet it is frequently a matter of common sense and ordinary thoughtfulness. Farming operations must be planned so that every aspect is covered. Labour is wasted if it is waiting for implements that have not been repaired in the proper season, if there is an insufficiency of carts to keep men employed at manure clamps or corn or hay stacks, and so forth. Similarly, it is often possible to kill two birds with one stone—to save a lot of otherwise wasted running about. The foresight of the employer may be recognized in his distribution and arrangement of duties.

As far as food stuffs are concerned, the introduction of effective rationing is absolutely essential. This applies not only to purchased foods, but to home-grown foods like hay, which this winter will be valuable.

There are, however, a good many other forms of waste that deserve attention. The careless protection of potato and root clamps is often responsible for serious loss. Similarly, there is often the practice of false economy that results in waste. This is seen in the neglect of live stock, which quickly reflect mismanagement. It is sometimes necessary to remember that a little attention given at the right time will prevent heavy expense later. On this basis

DECEMBER ON THE FARM

the farmer must recognize the force of "the stitch in time." Points of this kind may well distinguish the good farmer from the indifferent one.

The materials handled by the farmer may also influence waste or otherwise. Good labour is often wasted by inability to use proper equipment. This applies to cultural operations as well as to varieties of crops. Much progress has been made in safeguarding the purity of strains of seeds, as well as germination, but land is still wasted, for example, by the growing of potatoes from virus-infected stocks, while good seed may be wasted by failure to provide a proper seed bed.

It is a sound part of farming practice to examine one's achievements during the course of the year and to profit by the mistakes that have been made. In this sense it is imperative not only to review one's methods of management, but also one's system of farming in the light of waste elimination. The possibility of running a farm at high pressure the whole year round is best realized where the farming system is intensified and where live stock and arable interests are judiciously blended. Anything that interferes with the attainment of normal efficiency must be examined in the light of desirable amendment. Thus, if the shape and size of fields is such as to limit efficiency in arable farming, they should be made to agree with modern demands.

Pregnancy Test for Mares.—It is not recognized as widely as it deserves that a biological test of a mare's urine can be made to detect whether she is pregnant. The basis of the test depends upon the hormone content, and its reliability is such that from the sixtieth day after successful service it is possible to diagnose pregnancy with an accuracy of about ninety-eight per cent. The test requires the collection of about one teacupful of urine from the mare. The urine is treated to remove certain toxic products, following which it is neutralized and mice are injected with controlled doses. If the urine contains the hormones associated with pregnancy, cornification of the vaginal epithelium of the test mice takes place. It is easy to recognize the practical significance of a pregnancy test, particularly as a means of increasing confidence in the case of breeding mares that are offered for sale. The investigations that have led to this development have been conducted at the Institute of Animal Genetics at Edinburgh.

DECEMBER ON THE FARM

Seasonal Duties.—For outside work, December is not usually a busy month. The weather largely controls the extent to which arable operations are possible. Like November, it is very much a month of gloom, with a general marking of time as far as growth is concerned. In some parts wheat sowings continue in this month, but it is not regarded as one of the best months for seeding. Muck carting and ploughing are the principal duties when weather permits. When other jobs are scarce, the grass land can profitably receive attention, while the laying of hedges and the attention to dykes and ditches are means of occupying labour.

The effectiveness of grass land manuring is usually increased if some attention is paid to surface cultivation. The winter is a convenient period for practising operations that tend to destroy the surface mat on neglected grass land. This mat consists of much dead vegetable matter and roots, and when present absorbs water to such a degree that summer rainfall is prevented from reaching the soil, thereby limiting growth in a dry summer. In winter, such land tends to be waterlogged on the surface, while the grazing is inferior. Mismanagement is a common cause of matting of grass land. Understocking in years of abundant growth is particularly responsible, while matting may also be encouraged by unsuitable soil conditions, acidity in particular. The destruction of the existing mat should precede attempts to improve such land by manures and lime. Various implements are now available for mat destruction, and demonstrations are conducted in most counties to compare the different methods and implements.

NOTES ON MANURING

F. RAYNS, M.A., AND E. T. SYKES, M.A.,
Norfolk Agricultural Station.

Poultry Manure.—Between 1913 and 1934 the poultry population of England and Wales has been doubled; there are now over 60 million fowls in the country, excluding ducks, geese and turkeys.

According to Sayce and Hanley (this JOURNAL, October, 1932) fowl manure in the wet state contains 2.1 per cent. of nitrogen, 1.21 per cent. of phosphoric acid and 0.6 per cent. of potash. Edward Brown and Will Brown (this JOURNAL, March, 1907) gave similar but rather lower analyses, the poultry manure analysed by them containing rather more moisture.

When reduced by drying to a moisture content of 7.75 per cent., poultry manure becomes a fairly concentrated fertilizer; the nitrogen content is increased to 4.31 per cent., the phosphoric acid to 2.92, and the potash to 1.28 per cent., comparing quite favourably in analysis with rape cake and castor meal.

The possibility of poultry manure contributing to the nitrogen supply of the farm, and to a smaller extent to home-produced phosphoric acid and potash, is very great. If the whole of the output could be conserved, the 60 million fowls would add 45,000 tons of nitrogen to the land, or the equivalent of 218,000 tons of sulphate of ammonia. The value would be over 1½ million pounds sterling on the farm.

In 1932 the consumption of nitrogen for agricultural purposes was 58,607 tons; the nitrogen voided by our poultry is therefore roughly three-quarters of the total nitrogen we buy as fertilizers.

Similarly, the poultry output of phosphoric acid is worth £550,000, and of potash £216,000, the proportion of the total agricultural requirement thus produced being approximately one-fifth and one-fourth respectively.

Regarded in another way, the nitrogenous manure required for the five-course rotation mentioned in these notes for October this year would be supplied by 850 birds. A 500-acre arable farm could be self-contained as regards the

NOTES ON MANURING

replacement of nitrogenous artificial manures by establishing a poultry flock of 3,500 layers.

Interesting, however, as this speculation may be, the practical difficulty is in conserving the manure, much of which is voided under such perfectly hopeless conditions that it would be impossible in practice to realize anything approaching the above calculation. It is only from enclosed flocks or from folding units that fairly satisfactory conservation is possible; even then much is lost in the runs under the former method. Manure from dropping boards can, of course, be dried with suitable apparatus, while that from folding units is deposited exactly where it is required. Lacking a drier this last method is perhaps the best if the land is not too heavy, for fowls have other uses apart from being egg and manure producers; on arable fields, even the claws and beak of the hen can be employed with advantage.

The more practical aspects of the subject are being investigated by the Norfolk Agricultural Station at Sprowston, where it has been calculated that 1,000 birds moving systematically over an acre of ploughed land in a fortnight will leave behind about $1\frac{1}{2}$ tons of manure. This manure would be the equivalent in analysis of approximately 3 cwt. of sulphate of ammonia, $2\frac{1}{2}$ cwt. of superphosphate, and 40 lb. of muriate of potash—a mixture that only requires the addition of 1 cwt. of muriate of potash to make it a suitable one for sugar-beet.

Poultry may, of course, be folded on grass land, and at the rate suggested above would probably keep most grass fields in good condition if run over once in four years. Evenness of manuring is just as important on grass as on arable land, and experience at Sprowston indicates that a number of slatted-floor laying-arks, enclosed in a wire fold 4 ft. high, are better than the present fashionable folding unit. Folds of the former kind will retain the heavy breeds and if iron stakes are used are quickly removed and re-set. The houses are moved forward within the fold each day and the manure is collected from beneath the houses and spread by hand behind them.

Since, however, the output of manure, the consumption of food and the egg yield are roughly proportional, the distance the houses are moved each morning to ensure even manuring should vary according to the egg output. In practice, however, it is unnecessary to do more than use the weekly tally of eggs as a guide to field management. This

NOTES ON MANURING

system is particularly suitable for producing an early bite of grass, and the earlier the folding in the autumn the earlier will be the feed in the spring. The Sprowston experiences have shown that poultry manure will produce at least as early spring feed as sulphate of ammonia applied in February.

Sheep Folding.—An investigation by Keen and Cashen (*Jour. Agric. Sci.*, 1932, 22, 134) on the light Woburn soils showed that sheep trampling affected the soil to a depth of 4 in., the maximum compression occurring at a depth of 1-1½ in. The consolidation produced was not totally destroyed by ploughing and was apparent five weeks later when the seed was drilled. Nevertheless, the fact remains that some of the trampling effects were destroyed; indeed, it is difficult to see how the physical effects could be entirely preserved during the very thorough seed-bed preparation for a barley crop. The combined physical and chemical effects of sheeping in increasing yields, seem, therefore, more likely to be chemical than physical. The dung and urine of sheep are perhaps more potent than the effect of the hooves. Manuring by means of sheep, however, is by no means a simple job. Good judgment is required in deciding what proportion of the crop to feed and how to handle the sheep in the folds, especially when it is hoped to grow barley of high quality afterwards.

The malting quality of barley is to a considerable extent controlled by its nitrogen content, and is largely, but not entirely, a reflection of the nitrogen content of the soil. Obviously, the heavier the folding the higher will be the nitrogen content both of the soil and the resulting barley. Norfolk trials in 1931, for instance, showed that barley after sheep folding contained 1.61 per cent. of nitrogen, whereas on the same field the nitrogen content was 1.45, or 0.16 less, after roots carted off the land. Thus, sheep folding in preparation for barley must be appreciably influenced by the nitrogen content of the soil, or, in more homely farming language, the better the land the smaller the proportion of swedes, kale or whatever the crop may be, is it safe to fold. Hence has arisen the practice in the best barley districts of determining, by the heart of the land, the number of rows to be drawn off and the number to be fed to the sheep. During folding the shepherd's great difficulty is to leave each fold in the same condition as its neighbour; other-

NOTES ON MANURING

wise he may establish a number of areas each differing in nitrogen content and consequently producing a different sample of barley.

Of equal or rather more importance, perhaps, is the length of time and the extent to which sheep folding affects the land. That crop yields of the immediately following crops are increased is undisputed; the results of three years experiments at Sprowston suggest that the increase is between 7 and 9 bushels of barley per acre when eleven tons of swedes or $8\frac{1}{4}$ tons of beet tops are folded in the usual course of practice. The effects on the succeeding crop, however, are modified by folding at different times of the year. It is recognized that barley sown after a late fold is likely to be coarse, although the yield may be high if the barley stands. On the contrary, good barley growers know that early sowing, after early folding on sheep farms, is likely to produce the best quality, although the yield may be rather less. These effects have been measured at Sprowston, not in the extreme comparison of an October and April fold, but between folding swedes in mid-November and early February. The results, as often happens to some extent, confirm the opinions of practical men; the earlier sheeping increased the crop by 19 per cent. and the later sheeping by 25 per cent., but while the sheeping generally caused the nitrogen content of the grain to go up by the not very serious amount of 0.05 per cent., and the late sheeping produced a barley containing slightly more nitrogen, the effects were insufficient to affect malting quality.

So far, each series of trials has been continued for three years, and as increased crops of hay and wheat have been obtained in turn, to the extent of about 6 per cent. in each case, there is ample substantiation of the importance of the golden hoof in the manuring of the lighter arable lands.

A Crop Failure.—For some years the increased consumption of nitrogenous artificial manures has been a marked feature in home agriculture, but whereas the potash manures have been used in fluctuating quantities—on the whole tending to increase—there has been a definite reduction in the consumption of phosphatic fertilizers. Several years of agricultural depression may be a partial explanation, for the nitrogenous fertilizers are often regarded as a convenient means of cashing the reserves of the soil; in bad times, there is less incentive to add to the deposit

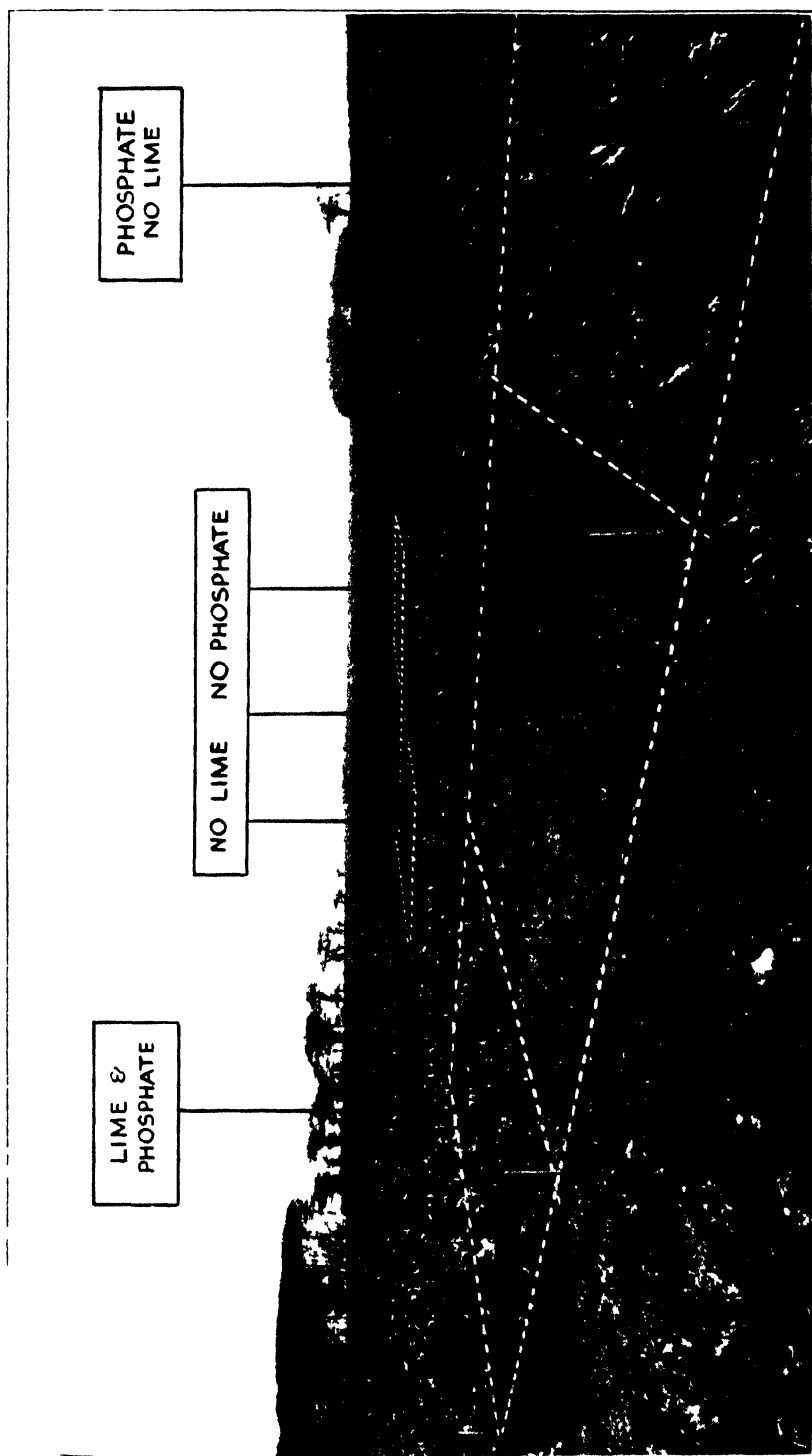
NOTES ON MANURING

account in the soil bank, and much more to draw upon it. In time, however, the account must become overdrawn and the bank manager must ask for the overdraft to be reduced, lest it should be necessary to close the account. This is true with any form of one-sided manuring, and there is much in our experimental station literature that shows the practice to be dangerous. Those with farming advisory responsibilities should not entirely preclude the possibility of crop reduction or even crop failure from phosphatic deficiencies; indeed, it is sometimes possible, as the accompanying illustration shows, for very spectacular effects to be obtained, for some soils have apparently already reached the danger point. The instance is perhaps worth referring to in greater detail.

A recent survey of East Norfolk soils, carried out in conjunction with the Advisory Chemist of the Eastern Province, showed that many of these soils were very low in available phosphate, and some of them, of which Gimingham, just south-east of Cromer, was a good example, were as low as 0.011 per cent. This soil also had a lime requirement of 29 cwt. per acre of calcium carbonate. A series of randomized plots was put down and the manures were applied in March. The results were very spectacular, a complete failure of the sugar-beet being prevented, as the following data show:—

		<i>Yield of washed beet per acre.</i>	
		<i>Without lime.</i>	<i>With lime.</i>
Without phosphates	.. ..	0.4 tons	0.9 tons
With phosphates	.. ..	4.2 tons	8.8 tons

In the presence of adequate lime it will be noted that the phosphates were much more effective. Now that farming prospects are rather better, the result is most valuable, for it reminds us not only that it is possible for the reserves of all manurial constituents to become so reduced after years of low farming that yields are impaired, but that the time is now opportune to remedy defects that bad times may have imposed. Artificial fertilizers are at or below pre-war prices, and there is no better short- or long-term investment than their intelligent use.



A randomized block experiment at Gimmingham, Norfolk, showing the complete failure of the sugar beet where no lime and phosphate were applied.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended November 14				
	Bristol	Hull	L'pool	London	Cost per unit at London
Nitrate of soda (N. 15½%) ..	£ 7 12d	£ 7 12d	£ 7 12d	£ 7 12d	s. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20.6%) ..	6 19d	6 19d	6 19d	6 19d	6 9
Calcium cyanamide (N. 20.6%)	6 19s	6 19s	6 19s	6 19s	6 9
Kainit (Pot. 14%) ..	3 0	2 14	2 12	2 14g	3 10
Potash salts (Pot. 30%) ..	4 11	4 6	4 4	4 6g	2 10
" (Pot. 20%) ..	3 12	3 6	3 3	3 6g	3 4
Muriate of potash (Pot. 50%)	7 4	6 16	6 12	6 16g	2 9
Sulphate " (Pot. 48%)	8 3	7 18	7 12	7 18g	3 3
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26.27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%)	3 2	..	3 2f	2 16k	3 6
" (S.P.A. 13½%)	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	..	6 17	6 15f	6 7	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 12	5 12	5 10f	5 10	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 13s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. B. MERCER, M.C., B.Sc. (Principal), and Colleagues,
Cheshire School of Agriculture, Reaseheath, Nantwich.

Autumn and Winter Grass.—Dr. Woodman and his colleagues at the Cambridge School of Agriculture have cast a beam of light upon an old controversy, by the publication of their latest research into the composition of pasture grass. Most farmers like to leave their stock out as late as possible in autumn, if only as a means of saving labour; and nearly all sheep farmers make a practice of "saving" some fields for winter grazing. Judged by modern ideas on pasture management, this latter seems bad practice; yet, to adopt a phrase from Shakespeare (Richard the Second), the north country farmer has taught his necessity to reason thus—that in snowy weather sheep can live on a rough pasture when they would starve on a lawn. In a sense, there can be no final settlement of a problem of this kind, since the two lines of argument never meet. Hitherto, however, the defendants have been in much the stronger position, as their facts were beyond dispute, whereas the advocates of close grazing have had to rely on inferences drawn from studies on summer grass. Now they also can quote chapter and verse for their faith.

The Cambridge trials leave no doubt as to the extent of true winter growth on permanent pasture in that area. In winters favourable to growth, plots produced but 339 lb. of dry matter per acre between the end of October and March, and only 576 lb. per acre between September and February, despite the application of sulphate of ammonia in early autumn. The grass had a high feeding value, but the authors of the report conclude that "the yields in both cases were too low to have any significance in farming practice." Probably this conclusion could with safety be applied to most of the pastures of the country. It is certainly true of much fertile land in the west. At Reaseheath, for instance, trials on hand-mown plots have for several years in succession petered out in October for the simple but sufficient reason that thereafter there was not enough grass to stand up to the scythe. Whatever virtues winter-produced grass may possess in the way of vitamins, it is of precious little value in satisfying the hungry.

NOTES ON FEEDING

Other plots at Cambridge, manured with sulphate of ammonia in July and then "shut up" yielded a considerable weight of forage in December—green and leafy, though seared with frost. This clearly represented, in the main, herbage grown during the months of August and September. It may therefore be taken as a fair sample of the grazing on a "rested" field. Its dry matter proved, on analysis, to have a starch equivalent of 56, and to contain 9.7 per cent. of digestible protein. It was quite definitely unpalatable to sheep—so unpalatable that the experimenters had great difficulty in inducing the sheep to eat a normal ration of it. Both the digestibility—or rather indigestibility—and the unpalatableness appear to have been referable to the slowness of growth.

Now "the bearing of these observations" as Captain Bunsby would say, "lays in the application on 'em." Autumn "saved" grass has clearly a feeding value far below that of good June grass, yet higher than average meadow hay. Its economic value turns on the nature of the animal consuming it.

Where, as with dairy cows, quality and digestibility are of supreme importance, autumn grass must be regarded as a poor feed. It is a poor feed also for fattening bullocks or sheep; they would, indeed, increase in weight on such a diet (if they would eat a full ration) but they would fatten slowly and at a steadily diminishing rate. For them the same rule applies in autumn as in summer—the sooner grass is eaten after it is produced, the better for the animal. "Graze as it grows" is the most economical policy—a policy entirely in keeping with modern conceptions of thrift! "Spend till it hurts" cries the economist embarrassed by problems of plenty. "Eat till you burst" responds the observant cow revelling in summer's flush.

With young and store stock and probably with ewes in early pregnancy, however, the position is different. Here quality of provender is of less consequence than cost: and Dr. Woodman's analyses do establish the fact that "saved" grass is a cheap fodder. In the Cambridge trials a July dressing of 1 cwt. sulphate of ammonia produced approximately 1,000 lb. of starch equivalent per acre in December—roughly one-third of a normal summer's growth. If the cost of a summer's grazing be put at £3 per acre, the cost of the autumn-saved grass cannot be assessed at more than 30s. At this rate the starch equivalent

NOTES ON FEEDING

was produced at less than 3s. 6d. per cwt. No alternative food could be produced at anything approaching this figure. Autumn grass is, indeed, the lees of summer's wine; but at any rate it is cheap. It is good enough for stock expected to grow but slowly—and no one has yet proved that a rapid rate of growth in, say, a dairy heifer, is desirable. Even the fact that it is unpalatable is of relatively little consequence. When there's no cake the young of all species soon learn to content themselves with bread and butter.

It is quite possible, too, that the plant physiologist, viewing the plant subjectively, may adduce evidence in support of the "saving" policy. The closeness of summer grazing is limited by the capacity of the plant to recover from defoliation. Probably "resting" pastures in the autumn has an effect resembling that of putting up for hay. Stapledon has shown how closely the yields of pasture plants in early summer are linked with the treatment in the previous year—in one experiment reported upon recently pure-species plots of various grasses put up for hay in the previous year outyielded plots grazed throughout by 100 per cent. in March and by nearly 50 per cent. in April. Probably a pasture rested in the autumn yields more heavily next spring (provided the leafage is eventually pulled off) than one from which all growth has been removed as produced.

Anyhow, the Cambridge investigators provide ammunition for both contestants; the impartial observer can but conclude, like George Eliot's immortal landlord of the Rainbow, "You're both right and both wrong, and the truth lies between you."

Early Spring Grass.—For early spring grass, reliance must be placed on the arable land. Forcing of permanent pastures, save in a few favoured spots, is a poor business compared with forcing temporary grass. Exact comparison of the relative capacities of permanent and temporary grass is almost impossible. Rarely if ever is a permanent pasture ploughed out under conditions that admit of a fair test of the two systems of management. The nearest approach one can make is to obtain the yields from fields in the same neighbourhood. At Reaseheath, yield tests from both temporary and permanent grass fields have been made for some

NOTES ON FEEDING

years, by wiring off plots and mowing periodically with a scythe. The following figures, recorded in 1932, illustrate the type of result obtained:—

Grass cut before June 1 (cwt. per acre).

		<i>Unmanured.</i>	<i>Heavily manured.</i>
Temporary		159	214
Permanent		24	44

With differences of this magnitude it is idle to discuss exact relative values. Temporary grass is obviously a subject of a different order altogether from permanent.

The actual yield obtainable from temporary pastures is determined by the type of mixture and by the system of management followed. March grass must be prepared for. It does not just come on its own. Far and away the most popular species for forcing is Italian Rye Grass, but it is noteworthy that in some of the Aberystwyth trials, certain strains of indigenous cocksfoot have proved at least its equal.

A Synthetic Hormone.—It is announced from Zürich, that androsterone, the male sex hormone, has been prepared artificially. Even in an age of scientific marvels this is a notable achievement. The nature of hormones, those queer traffic directors of the living body, is still imperfectly understood; for the most part hormones are obtained only with great difficulty. Hitherto, such as have been extracted, have found application mainly in medicine; there are others for which conceivably economic use in other directions may shortly be found—fecundity in fowls and lactation in mammals are apparently both controlled by secretions of ductless glands. The imagination is apt to run riot with the contemplation of what *may* follow from the synthesis of a typical hormone. Practical results do not always follow scientific advances of course. Many laboratory discoveries remain for generations mere academic “exhibits.” It may be that such a fate awaits this particular discovery. None the less the observant will store it in the “matters pending” file of memory.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu-rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro-tein equiv.
Wheat, British	£ 5 0	£ 0 8	£ 4 12	72	s. d. 1 3	d. 0.67	% 9.6
Barley, British feeding	7 5	0 7	6 18	71	1 11	1.03	6.2
" Canadian, No. 3 Western ..	7 2	0 7	6 15	71	1 11	1.03	6.2
" Danubian	6 13†	0 7	6 6	71	1 9	0.94	6.2
" Persian	6 15‡	0 7	6 8	71	1 10	0.98	6.2
Oats, English white	7 0	0 8	6 12	60	2 2	1.16	7.6
" black and grey	7 0	0 8	6 12	60	2 2	1.16	7.6
" Scotch White	7 17	0 8	7 9	60	2 6	1.34	7.6
" Canadian No. 2 Western ..	7 15	0 8	7 7	60	2 5	1.29	7.6
" " No. 3	7 15*	0 8	7 7	60	2 5	1.29	7.6
" " mixed feed	6 7	0 8	5 19	60	2 0	1.07	7.6
" Argentine	8 0	0 8	7 12	60	2 6	1.34	7.6
" Chilian	7 15	0 8	7 7	60	2 5	1.29	7.6
Maize, Argentine	5 3	0 6	4 17	78	1 3	0.67	7.6
" Gal. Fox	5 2†	0 6	4 16	78	1 3	0.67	7.6
" South African, No. 2 White Flat	5 12†	0 6	5 6	78	1 4	0.71	7.6
Beans, English, winter	5 10‡	0 15	4 15	66	1 5	0.76	10.7
Peas, English, blue	10 10	0 13	9 17	69	2 10	1.52	18.1
" Japanese	17 10	0 13	16 17	69	4 11	2.63	18.1
Dari	7 10	0 7	7 3	74	1 11	1.03	7.2
Milling offals—Bran, British ..	6 12	0 14	5 18	43	2 9	1.47	9.9
" broad	6 17	0 14	6 3	43	2 10	1.52	10
Middlings, fine, imported ..	6 12	0 11	6 1	69	1 9	0.94	12.1
Weatings†	6 12	0 12	6 0	56	2 2	1.16	10.7
" Superfine†	7 5	0 11	6 14	69	1 11	1.03	12.1
Pollards, imported	6 7	0 12	5 15	50	2 4	1.25	11
Meal, barley	8 2	0 7	7 15	71	2 2	1.16	6.2
" grade II	7 7	0 7	7 0	71	2 0	1.07	6.2
" maize	6 2	0 6	5 16	78	1 6	0.80	7.6
" " South African ..	5 15‡	0 6	5 9	78	1 5	0.76	7.6
" " germ	6 2	0 10	5 12	79	1 5	0.76	8.5
" locust bean	7 10	0 5	7 5	71	2 1	1.12	3.0
" bean	8 5	0 15	7 10	66	2 3	1.21	19.7
" fish	16 10	1 18	14 12	39	4 11	2.63	53
Maize, cooked, flaked	6 12	0 6	6 6	84	1 6	0.80	9.2
" gluten feed	6 0	0 12	5 8	76	1 5	0.76	19.2
Linseed cake, English, 12% oil ..	9 17	0 18	8 19	74	2 5	1.29	24.6
" " " 9% " ..	9 10	0 18	8 12	74	2 4	1.25	24.6
" " " 8% " ..	9 5	0 18	8 7	74	2 3	1.21	24.6
" " " 6% " ..	9 7‡	0 18	8 9	74	2 3	1.21	24.6
Soya-bean cake, 54% oil	8 0‡	1 5	6 15	69	1 11	1.03	36.9
Cottonseed cake—English, Egyptian seed, 44% oil ..	4 12	0 16	3 16	42	1 10	0.98	17.3
" " Egyptian, 44% " ..	4 12	0 16	3 16	42	1 10	0.98	17.3
" " decorticated, 7% " ..	7 0†	1 5	5 5	68	1 7	0.85	34.7
" " meal, decorticated, 7% " ..	7 2†	1 5	5 17	68	1 9	0.94	34.7
Coconut cake, 6% oil	6 12	0 16	5 16	77	1 6	0.80	16.4
Ground-nut cake, 6.7% oil	6 17*	0 17	6 0	57	2 1	1.12	27.3
" " " decor., 6.7% oil ..	7 5	1 5	6 0	73	1 8	0.89	41.3
" " " imported, decorticated, 6.7% oil ..	6 2	1 5	4 17	73	1 4	0.71	41.3
Palm-kernel cake, 44-54% oil ..	6 5†	0 11	5 14	73	1 7	0.85	16.9
" " " meal, 44% oil ..	6 5†	0 11	5 14	73	1 7	0.85	16.9
" " " meal, 1.2% oil ..	5 17	0 11	5 6	71	1 6	0.80	16.5
Feeding treacle	5 0	0 7	4 13	51	1 10	0.98	2.7
Brewers' grains, dried ale	5 17	0 10	5 7	48	2 3	1.21	12.5
" " " porter	5 10	0 10	5 0	48	2 1	1.12	12.5
Dried sugar beet pulp (s)	5 5	0 5	5 0	66	1 6	0.80	5.2

(a) Carriage paid in 5 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of October, 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 10 then since its manurial value is 18s. per ton as shown above, the food value per ton is £9 2s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 12s. 6d. Dividing this again by 27.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1s. 3d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the market.
 Manurial value per ton are calculated

FARM VALUES OF FEEDING STUFFS

Farm Values. —The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	6 17
Maize	78	7.6	5 4
Decorticated ground-nut cake ..	73	41.3	6 16
„ cotton cake	68	34.7	7 2

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.68 shillings, and per unit protein equivalent, 0.81 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1934, issue of the Ministry's JOURNAL, p. 808.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 9
Oats	60	7.6	5 7
Barley	71	6.2	6 4
Potatoes	18	0.8	1 11
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 12
Beans	66	19.7	6 7
Good meadow hay	37	4.6	3 6
Good oat straw	20	0.9	1 14
Good clover hay	38	7.0	3 10
Vetch and oat silage	13	1.6	1 3
Barley straw	23	0.7	1 19
Wheat straw	13	0.1	1 2
Bean straw	23	1.7	2 0

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

The Agricultural Index Number

THE general index number of the prices of agricultural produce for October at 115 (the corresponding month of 1911-13 = 100) was 4 points below the previous month, but 8 points higher than in October, 1933, and above the index for any October since 1930. Price changes were numerous during the month under review, but the factors mainly responsible for the decrease of 4 points in the general figure were substantial reductions in the prices of fat cattle and barley, the lower index for milk, and to a lesser extent the reduced values for bacon pigs and potatoes. These decreases, however, were offset in some measure by increases in the prices of fat sheep, pork pigs and eggs.

Monthly index numbers of prices of Agricultural Produce.
(Corresponding months of 1911-13 = 100.)

Month.	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	108
April	146	137	123	117	105	111
May	144	134	122	115	102	112
June	140	131	123	111	100	110
July	141	134	121	106	101	114
August	152	135	121	105	105	119
September	152	142	120	104	107	119
October	142	129	113	100	107	115
November	144	129	112	101	109	—
December	143	126	117	103	110	—

Grain.—Wheat at an average of 5s. per cwt. was 1d. cheaper than in September and the index declined one point to 67. If allowance is made for the "deficiency payment" under the Wheat Act, 1932, the index would be increased to approximately 128, the effect of which would be to raise the general index for agricultural produce from 115 to 119. A sharp decrease of 1s. 2d. to 9s. 5d. per cwt. occurred in the average for barley, the index depreciating 16 points to 111. Oats at 6s. 6d. per cwt. were 1d. per cwt. cheaper on the month and the index at 94 was 4 points lower. In October last year, wheat averaged 4s. 10d., barley 10s. 2d., and oats 5s. 5d. per cwt., the indices being 65, 120 and 78 respectively.

MISCELLANEOUS NOTES

Live Stock.—Quotations for fat cattle were much lower during October; the average of 32s. 7d. per live cwt. for second quality declined by 2s. 2d., and the index fell by 7 points to 97. A year ago the average price was 33s. 2d. and the index 99. Fat sheep were $\frac{1}{4}$ d. per lb. dearer and the index moved upwards by 4 points to 128, as compared with an increase of 7 points to 107 in October, 1933. Values for bacon pigs again declined, the average being 3d. per score less than in September and the index 3 points lower at 99. On the other hand, porkers were 3d. per score dearer, the index advancing 3 points to 112. In both classes, however, the October indices were 2 points above those of a year ago. A rise was noticeable in the prices of dairy cows and the index was 2 points higher at 107, but store cattle were a little cheaper and the index fell 3 points to 85. Store pigs also sold cheaper, but as the decline which occurred in the base period was proportionately larger, the index at 143 was 1 point higher. Store sheep were dearer and the index moved upwards by 1 point to 114.

Dairy and Poultry Produce.—In most regions the wholesale contract prices for liquid milk were 4d. per gallon higher than in September, but a rise occurred also in the base price in this period, and as this was proportionately greater than in the period under review, the index showed a fall of 7 points to 161. In October, 1933, there was a fall of 3 points to 157. The average price for butter was unaltered as compared with September, but the index at 84 was 3 points lower. Cheese realized slightly higher prices during the month under review, but the index declined 1 point to 93. Values for eggs recovered from the low levels ruling in September and the rise of $4\frac{1}{2}$ d. per dozen was reflected in the advance of 12 points in the index to 115, which was 3 points higher than a year ago. Prices for fowls and ducks continued to fall, but geese were again dearer; the combined index for poultry declined by 1 point to 116.

Other Commodities.—Quotations for potatoes declined further during October, and the index at 151 was 7 points lower than in the previous month, whereas in the corresponding period a year ago there was a rise from 99 to 110. Values for hay continued to appreciate slightly, but the index was 3 points lower. Wool was a little cheaper, and the index was 2 points lower at 85. Apples and most classes of

MISCELLANEOUS NOTES

vegetables were cheaper than at the corresponding period last year.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1932	1933	1934			
	Oct.	Oct.	July	August	Sept.	Oct.
Wheat	75	65	66	64	68	67
Barley	95	120	98	123	127	111
Oats	90	78	83	92	98	94
Fat cattle ...	102	99	99	106	104	97
„ sheep ...	83	107	128	128	124	128
Bacon pigs ...	82	97	105	103	102	99
Pork „ ...	88	110	108	108	109	112
Dairy cows ...	118	114	104	104	105	107
Store cattle ...	100	89	85	85	88	85
„ sheep ...	72	86	108	104	113	114
„ pigs ...	89	139	135	139	142	143
Eggs	121	112	97	119	103	115
Poultry	126	122	114	116	117	116
Milk	145	157	168	168	168	161
Butter	95	98	87	92	87	84
Cheese	114	103	90	96	94	93
Potatoes	120	110	136	153	158	151
Hay	67	74	91	101	104	101
Wool	62	79	86	87	87	85

Revised index numbers due to Wheat Act payments.

Wheat	132	128	118	119	127	128
General Index	104	112	117	123	123	119

Paget Memorial Prize

As a memorial to the late Leopold C. Paget, the Council of the National Pig Breeders' Association has decided to offer an annual prize of £15 (to be devoted wholly or partly to the purchase of books), and a medal, for an essay on some subject connected with the pig industry. The Prize will be open to competition among all British subjects who have been *bona fide* agricultural students in Great Britain and have pursued courses of study, of not less than two years' duration, in an agricultural teaching institution recognized by the Ministry of Agriculture and Fisheries, the Board of Agriculture for Scotland, or the Ministry of Agriculture for Northern Ireland; and essays submitted must be accompanied by a certificate of attendance from a responsible official of the agricultural educational institution at which the competitor was a student.

MISCELLANEOUS NOTES

Competitors must not be over 30 years of age on the last day for submitting essays, which is June 30 in each year. Further particulars may be obtained from the Secretary, the National Pig Breeders' Association, 92, Gower Street, London, W.C.1.

Potato Acreages in Scotland, 1934

THE following table, which has been prepared from a statement issued by the Department of Agriculture for Scotland, shows the acreages of potatoes grown in Scotland in 1934, with corresponding acreages in 1933:—

	1934. Acres.	1933. Acres.
Total acreage grown ..	143,000	153,000
Total first earlies..	16,600	17,900
Total second earlies ..	14,600	15,200
Total main crops ..	91,700	101,500
Area unclassified ..	20,068	18,363

Acreage figures for the most important varieties only are as follows:—

	1934. Acres.	1933. Acres.
<i>First Earlies:—</i>		
Epicure	9,021	9,759
Sharpe's Express	1,893	2,684
Eclipse, etc.	2,161	2,383
Duke of York, etc.	1,977	1,827
Ninetyfold	323	308
May Queen	200	215
<i>Second Earlies:—</i>		
Great Scot	9,296	8,810
British Queen, etc.	3,363	3,894
Royal Kidney, etc.	210	675
Ally	281	421
Edzell Blue	332	325
Ben Lomond	225	258
Arran Comrade	229	231
<i>Main Crops:—</i>		
<i>Immune.</i>		
Kerr's Pink	41,486	56,739
Majestic	14,011	11,116
Golden Wonder	9,080	8,822
Dunbar Cavalier	655	1,971
Arran Banner	2,843	1,795
Arran Consul	1,014	1,144
<i>Non-immune.</i>		
King Edward VII	16,489	14,188
Arran Chief	1,915	1,729
Up-to-Date	1,085	879
Field Marshal	298	459

The total acreage of potatoes planted in Scotland in 1934 was less than in 1933 by 10,000 acres, or 6½ per cent., and was approximately 5,000 acres below the total for 1932.

MISCELLANEOUS NOTES

The estimated yield of potatoes for the year 1934 is given as about 975,000 tons or 100,000 tons less than for 1933.

Agricultural Returns of England and Wales, 1934 : Produce of Hops

PRELIMINARY statement showing the estimated total production of hops in the years 1934 and 1933, with the acreage and estimated average yield per statute acre in each county of England in which hops were grown; and the average yield per acre of the ten years 1924-1933 :—

Countries, etc.			Estimated Total Produce		Acreage returned in June		Estimated Average Yield per Acre		
			1934	1933	1934	1933	1934	1933	Average of the 10 years 1924—1933
			Cwt.	Cwt.	Acres	Acres	Cwt.	Cwt.	Cwt.
Kent	East	...	37,500	31,000	2,097	2,001	17'9	15'5	14'9
	Mid	...	48,500	35,500	2,862	2,629	16'9	13'5	13'8
	Weald	...	70,600	60,700	5,050	4,736	14'0	12'8	12'7
	Total, Kent		156,600	127,200	10,009	9,366	15'6	13'6	13'5
Hants	...	...	7,800	6,700	583	536	13'4	12'4	11'7
Surrey	...	...	1,600	1,100	93	89	17'6	11'7	11'3
Sussex	...	...	22,500	17,300	1,420	1,200	15'9	14'4	12'9
Hereford	...	...	45,700	41,900	4,016	3,805	11'4	11'0	10'6
Worcester	...	...	24,000	20,800	1,851	1,838	13'0	11'3	9'7
Other Counties*	...	...	800	1,000	65	61	12'2	15'0	11'0
Total	...	...	259,000	216,000	18,037	16,895	14'4	12'8	12'5

* Salop, Gloucester, and Berkshire.

The returns made in June, 1934, by occupiers of agricultural holdings indicate that the acreage under hops has been appreciably increased since last year, the total area being 1,142 acres more than in 1933. The area estimated as left unpicked this year amounted to about 273 acres, which although appreciably larger than the very small area, viz., 20 acres, not picked in 1933, is small compared with 1931 or 1930 when the unpicked areas were 1,600 acres and 3,500 acres respectively. The increase in the acreage under hops was greatest in the counties of Kent, Sussex and Hereford, though all areas show increases of varying amounts.

MISCELLANEOUS NOTES

The average yield per acre over the whole of the hop-growing area was 14.4 cwt. compared with 12.8 cwt. for 1933, and an average of 12.5 cwt. for the ten years 1924-1933, and the total production for this year is estimated by the Ministry to be 259,000 cwt. In 1933, the total production was estimated to be 216,000 cwt.

The figure issued by the Hops Marketing Board is 157,591 pockets, which are equivalent to approximately 239,200 cwt. Apart from the fact that the Ministry's figure is an estimate, the Marketing Board's figure relates to hops of the 1934 crop consigned to the Board for sale: the latter does not include the production by brewer users or the hops grown under contract, and the difference between the two figures is probably due largely to these factors.

Weather conditions this year have generally been favourable to the crop, and disease and insect pests have, on the whole, been less prevalent than usual. The quality of the crop is good.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Monday, November 19, 1934, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders:—

Dorset.—An Order fixing minimum and overtime rates of wages to come into force on December 9, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 7, 1935. The minimum rates are (i) in the case of male workers of 21 years of age and over 31s. 6d. (instead of 30s. as at present) per week of 53½ hours in summer except in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall, when the hours are 44, and 48 hours in winter except in the week in which Christmas Day and Boxing Day fall, when the hours are 31; (ii) in the case of female workers of 21 years of age and over (other than part-time casual workers) 24s. (as at present) per week of 48 hours except in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall when the hours are 39½, and in the week in which Christmas Day and Boxing Day fall when the hours are 31; with in addition in the case of all workers previously referred to, not more than 3 hours on Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day respectively on work in connection with milking and the care of and attendance upon stock; and (iii) in the case of part time or casual female workers of 18 years of age and over 5d. per hour as at present. The overtime rates are unchanged at 8d. per hour for male workers of 21 years of age and over (except for overtime employment in the hay and corn harvests when the rate is 9d. per hour) and 6d. per hour for all classes of female workers of 20 years of age and over.

MISCELLANEOUS NOTES

Staffordshire.—An Order varying as from November 25, 1934, the existing minimum and overtime rates of wages. The minimum rates as varied for male workers of 21 years of age and over are 31s. 6d. (instead of 30s. as at present) per week of 54 hours with overtime unchanged at 9d. per hour. For female workers of 18 years of age and over the minimum rate remains unchanged at 5d. per hour with overtime at 6d. per hour.

Surrey.—An Order fixing minimum and overtime rates of wages to come into force on December 23, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 21, 1935. The minimum rate for skilled male workers (horsemen, stockmen and shepherds) of 21 years of age and over is 38s. 8d. (instead of 37s. as at present) per week of 60 hours except in the weeks in which Christmas Day and Good Friday fall when the hours are 51. For other male workers (except casual workers) of 21 years of age and over the minimum rate is 32s. 3d. (instead of 30s. 9d. as at present) per week of 50 hours except in the weeks in which Christmas Day and Good Friday fall when the hours are 41. In both cases provision is made for the payment of the minimum rate of wages in respect of the reduced number of hours in Easter week instead of the week in which Good Friday falls if a holiday is given on Easter Monday in lieu of one on Good Friday. The minimum rate for casual male workers of 21 years of age and over is 7½d. (instead of 7¼d. as at present) per hour. The overtime rates for all classes of adult male workers are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays. For female workers of 18 years of age and over, the minimum rate remains unchanged at 5½d. per hour with overtime at 7d. per hour on weekdays and 8d. per hour on Sundays.

Yorkshire (East Riding).—(1) An Order fixing minimum and overtime rates of wages to come into force on November 24, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until November 23, 1935. The minimum rates for male workers are as follows: for workers living in the rate is unchanged at 32s. per week, or £81 12s. 0d. per year for foremen; 30s. per week, or £76 10s. 0d. per year (instead of 29s. per week or £73 19s. 0d. per year as at present) for beastmen and shepherds; and 28s. per week, or £71 8s. 0d. per year (as at present) for waggoners; with lesser rates for lads and beginners, and for workers of 21 years of age and over not boarded and lodged by their employer, 33s. 6d. (instead of 32s. as at present) per week. The hours in respect of which the above rates are payable are 52½ in summer except in the week in which Good Friday falls when the hours are 43, and 48 in winter except in the week in which Christmas Day falls when the hours are 39½, with in addition in the case of workers living in not more than 12 hours per week on weekdays and 3 hours on Sunday spent on the care of and attention to stock. The overtime rates for male workers of 21 years of age and over are unchanged at 10d. per hour on weekdays and 1s. per hour on Sundays, Good Friday and Christmas Day. For female workers of 16 years of age and over the minimum rates remain unchanged at 6d. per hour with overtime at 9d. per hour.

(2) An Order fixing special differential rates of wages for overtime employment on the corn harvest of 1935, the rate for male workers of 21 years of age and over who are not boarded and lodged by their employer being 1s. 3d. per hour, and the rate for male workers who are boarded and lodged by their employer 1s. per hour for foremen, beastmen, shepherds and waggoners. For female workers of 16 years of age and over the rate is 11d. per hour.

NOTICES OF BOOKS

Enforcement of Minimum Rates of Wages.—During the month ending November 14, legal proceedings were taken against seven employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area.	Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
		£ s. d.	£ s. d.	£ s. d.	
Derby ...	Haddon ...	*	2 4 6	4 15 10	1
Yorks, N.R. ...	Easingwold ...	†	—	—	3
" ...	Helmsley...	1 0 0	5 0	4 4 4	1
" ...	" ...	2 0 0	6 0	14 4 4	2
Yorks, W.R. ...	Doncaster	5 0 0	8 0	12 5 1	1
Carmarthen ...	Llanfihangel	10 0	—	23 0 2	1
Denbigh and Flint ...	Llangollen	10 0	—	30 0 0	2
		£9 0 0	3 3 6	88 9 6	11

* Dismissed under Probation of Offenders Act.

† Case dismissed.

APPOINTMENTS

County Agricultural Education Staffs

ENGLAND

Northamptonshire.—Mr. J. A. Lindsay, B.Sc. (Agric.), has been appointed Assistant Agricultural Organizer, *vice* Mr. H. L. Webb, M.A.

Mr. A. T. G. Trew, N.D.A., N.D.D., has been appointed Assistant Dairy Instructor, *vice* Mr. W. J. England, N.D.A.

Wiltshire.—Mr. R. J. Fleming, N.D.D., B.D.F.D., has been appointed County Dairy Instructor, *vice* Mr. T. C. Goddard, B.Sc., N.D.D.

NOTICES OF BOOKS

Man versus Rabbit. By A. H. B. Kirkham, F.R.C.S.E., L.R.C.P. (London), F.Z.S. 2nd ed. Pp. vi+74. Illus. (London: University of London Animal Welfare Society, 68, Torrington Square, W.C.1 1934. Price 1s.)

This brochure by the Honorary Secretary for Wild Life, University of London Animal Welfare Society, sets out the case for the "Gin Traps (Prohibition) Bill," which is being promoted by the Society with the support of other organizations. The operative clause of the Bill, the text of which is printed in the book, provides that "Subject to the provisions of this Act it shall not be lawful for any person to manufacture, sell or expose for sale, or use, or knowingly to have in his possession or custody, any gin trap." The expression "gin trap"

NOTICES OF BOOKS

is defined as "a trap so constructed that, in its usual operation, it catches mammals or birds alive by gripping a limb by means of jaws, teeth or clamps in such a manner as to cause pain."

The author's case for the Bill, as stated in the opening words of Chapter 2, is that "The gin or steel trap is inconsistent with modern standards of humaneness." It is claimed that, on the whole, the steel trap is associated with the multiplication rather than the reduction of rabbits, and two chapters are devoted to alternative methods recommended for dealing with both rabbits and "vermin." Appendices deal, *inter alia*, with experiences with the use of the spring trap and other methods in various parts of this country and in Australia, the sex ratio of captured rabbits, and instructions for using the long net and for exterminating rabbits and rats with motor-car exhaust gas.

Die Landwirtschaft von England und Wales: Versuch einer geographischen Darstellung ihrer landschaftlichen Verschiedenheiten (*The Agriculture of England and Wales: An attempt at a Regional geography.*) By Heinrich Keldorfer. Pp. x + 196; 10 Figures and 6 Tables. (Freiburg im Breisgau: Selbstverlag der Geographischen Institute der Universitäten. 1933. Price RM. 5.50.)

This is, undoubtedly, the most important survey of British farming that has been made since the war. Although Dr. Keldorfer did not make a tour of the country, his work is of parallel importance with that of Sir Daniel Hall and of Rider Haggard before the War, and of Caird in 1851.

Teutonic thoroughness has become a by-word, almost a reproach, when applied to work done in this country, but it is impossible to deny that Dr. Keldorfer's work is an example for all those who are working along the same lines, whether they are dealing with particular localities, or with the country as a whole.

It has frequently been pointed out that the administrative county does not bear very much relation to the geographical and economic significance of the areas, and Dr. Keldorfer has emphasized this point, both verbally and by his method. In the first part of his work he describes the physical regions of the country and shows how these physical regions have affected the local type of farming. This part of the work is of the utmost use. The various divergencies due to natural factors are completely surveyed, and the particular products of the various localities are carefully analysed. This is perhaps the most strictly economic-geographical part of the work. The second part deals with the natural conditions under which farming is carried out in this country, and is divided into the natural sub-heads of climate, soil, and relief and vegetation. In the last part of this chapter, Dr. Keldorfer discusses the indigenous flora of the country as an indication of the lines along which agriculture develops, much in the same way as some of our earliest writers dealt with the relation between the soil and the plant.

The third part of the book is devoted to the social aspects of farming in this country, marketing, transport, subsidiary industries, population and its distribution, and the agricultural holding in relation to all the factors that influence it, the various forms of occupancy, and social and economic questions.

This extremely careful study deserves to be well known in this country, and it may be suggested that, in order that it may be more widely read than is possible in its original language, a translation should be undertaken.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 10 January, 1935

NOTES FOR THE MONTH

Need for Marketing Co-operation

At the Annual Dinner of the Sevenoaks and District Fat Stock Show Association at the Wildernesse Country Club near Sevenoaks, on Dec. 13, Lord De La Warr stressed the need for co-operation with the distributive trades

“ The last three years have been difficult and harassing ones for agriculture—for every element of it, from the small-holder to the Minister—but great efforts have been made and we are now beginning to see results.”

“ The case for the Marketing Acts is that they give the farmer an opportunity to organize to meet the old charge that his methods of selling and marketing his goods were inefficient and out of date. In pre-Marketing Act days there was no alternative to allowing a good crop to go on to the market in any form and in any quantity, regardless of the amount that could be absorbed at a price that would enable production to continue.”

“ It should be emphasized that the purpose of marketing reform is to afford a stable and secure basis on which to plan for reduction of cost in both production and distribution. The scheme for cheap milk in the schools could not have been put into operation unless the Milk Marketing Board had first organized and stabilized the market. If we bring order out of chaos in the markets for home produce and in the imported food markets we make possible an advance along routes hitherto impassable; we can expand our distributive tracks into arterial roads; we can develop our resources. This is what organized marketing means; and this is what the Government has supported and encouraged from the beginning.”

NOTES FOR THE MONTH

“ In particular, it must always be in the interest of any producers' organization that is given power to control surplus, to contrive to divert that surplus to useful purposes, as in the milk-in-schools scheme. In adopting such a policy the organization could certainly count on the support of enlightened public opinion, and of the Government; but before putting it into practice, there are many difficulties to be faced and many interests to be considered. To begin with, the distributor has a right to a hearing. If efforts to secure increased consumption in the distressed areas or elsewhere had the effect of seriously injuring the shopkeepers it would be a poor contribution indeed to a restoration of prosperity. The organization of agricultural marketing has proceeded on a basis of co-operation between the farmers and the Government. They and the Government have been working together to put into action a policy that both have helped to shape. In the same spirit we should wish to seek and will no doubt secure the co-operation of the distributive trades, and of those who are concerned with the trades' practical, everyday affairs. As long as there are hungry men and women when there is also a glut of food, we must all admit that there are problems of distribution that are still defeating us. I am sure that every distributor would welcome, and indeed would desire to assist, any attempt to find a solution of those problems, for they must be solved if our civilization is to be preserved.”

Derangement of Digestive Processes in Milk-fed Calves

The derangement of digestive processes in milk-fed calves formed the subject of a paper by E. J. Sheehy, B.Sc., F.R.C.Sc.I., University College, Dublin, which appeared in the August, 1934, issue of the “Scientific Proceedings of the Royal Dublin Society.”

The paper gives particulars of two series of calf-feeding experiments carried out in the University College, Dublin, and on privately-owned farms respectively, and because most stock-raisers have experienced serious losses amongst calves, especially during the first four weeks following birth, it is believed that the following summary of this paper will be of interest to readers to the JOURNAL.

The findings of these experiments show that digestive disorganization in bucket-reared calves is due to abnormal curd formation in the fourth stomach, and that this is one of the causes of casualties. Post-mortem examinations showed an

NOTES FOR THE MONTH

accumulation of dense, cheesy curd that had caused irritation of the stomach lining and sometimes rupture of blood-vessels. This condition was caused by the inability of the proteolytic enzyme (pepsin) of the stomach to digest, in the intervals between successive feeds, the clot produced by the action of rennin on the milk.

Experiments both at the College and on privately-owned farms suggested a simple method of treatment, i.e., the dilution of the milk with water, with the object of modifying the nature of the rennin clot. This method proved highly successful, both as a preventive and a remedy. In all cases the proportion of water to be added to the milk depends on the number of times the calf is fed daily and on the relative vigour of the stomach proteolytic enzyme in the individual animal. The withholding of all milk and the feeding of water only for a day, followed by a much-diluted milk for a few days, caused the disappearance of the accumulated curd from the stomach.

As examples of successful treatments, 12-day-old calves that were seriously ill, and showing persistent diarrhoea, were given a mixture of equal parts of water, the water being first boiled and then reduced to blood heat before being added to the milk.

This was fed four times a day, one pint being given at each feed for the first day and two pints thereafter, till in six days the diarrhoea had disappeared and normal conditions returned. Other calves that developed similar symptoms of disorder received water for one day only, the quantity given being two pints per feed three times in twenty-four hours. This was succeeded by milk and water in equal parts, given at the same rate for the next two days, by which time the faeces were again normal and the other symptoms of ill-health had disappeared.

To distinguish between contagious white scour in calves, caused by bacterial invasion of the body, and the scour or diarrhoea resulting from the accumulation of abnormal curd in the stomach, which is the subject of Mr. Sheehy's paper, the author gave to the latter trouble the name or nutritional white scour.

One farm was much troubled by contagious white scour, to which was attributed the loss of a very considerable number of young calves each year. When, however, sick animals were treated as suggested above, and all animals had some water added to the milk from birth, the number

NOTES FOR THE MONTH

of casualties was reduced to one-half, showing that in about half the cases of ill-health previously experienced among the calves the diarrhoea was of a nutritional rather than a bacterial origin. Reports from numerous other farmers were of a similar nature, and practical feeders are agreed that what was then a very big problem has since been solved.

The author also states that calves that are pail-fed from infancy rarely make the same progress as those suckled by the cow. When feeding is done twice daily by the pail process, the quantity of milk ingested at each meal is six or eight times greater than that which would be taken at any one time by a calf that is at liberty to suckle from the cow at frequent intervals. It is noted that very severe cases of stomach disorder among milk-fed calves occur where stale milk is fed. This, it is suggested, is probably due to the fact that a second clotting agent is introduced, namely, acid. An acid milk entering an acid stomach may in a very short time reach a point at which, even in the absence of rennin, clotting would occur, and in the meantime rennin clotting has been proceeding.

There is a more frequent occurrence of digestive derangement among purchased calves, particularly those secured from dealers, than in the case of calves born on the farm where rearing takes place. Though transport and exposure to chills predispose animals to disease, the chief cause of trouble is the absence of beestings from the diet and the fact that the calves are usually fed on the mixed milk of a herd, which, as mentioned above, produces a less digestible curd than milk from a cow at the beginning of lactation.

In short, milk from freshly-calved cows, diluted with water, the degree of dilution depending on the relative degree of stomach weakness, will save the farmer loss in cattle, and assist in the rearing of a healthy and profitable herd.

Weed Control in Asparagus

THE following note, being a preliminary report on the results of a trial, has been communicated by Mr. J. C. Wallace, M.C., Principal of the Agricultural Institute and Experimental Station, Kirton, near Boston, Lincs:--

The planting of asparagus on light lands in the Holland Division raises the problem of keeping the crop clean during the cutting season. These light lands are often seriously



Fig. 1. Centro I.



Fig. 2. C de um C v m um le 3 3 3 3

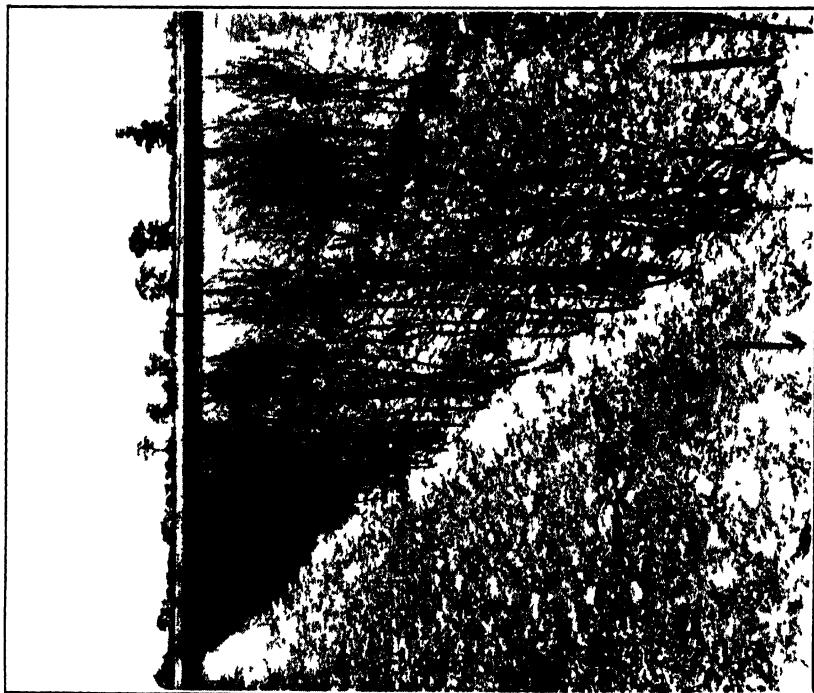


FIG 3 —Calcium Cyanamide 6 cwt

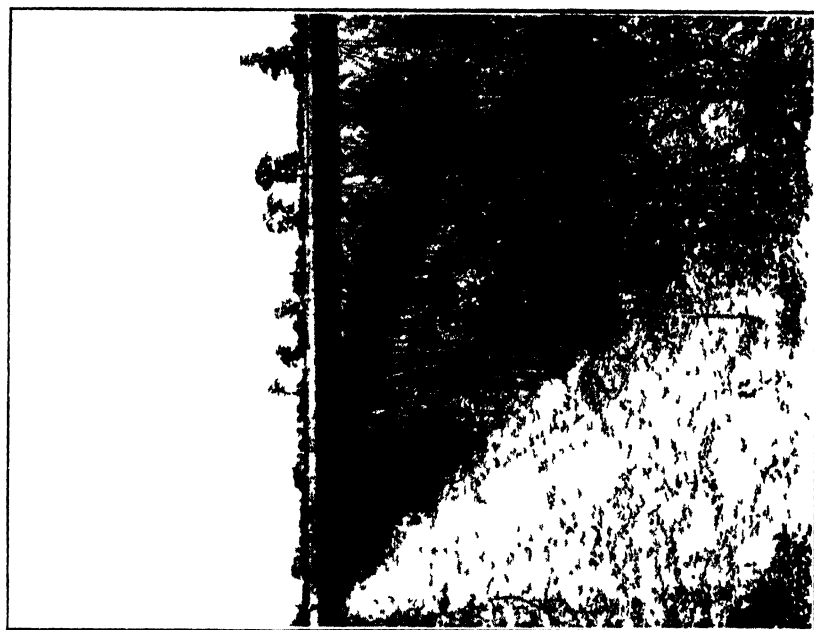


FIG 4 —Calcium Cyanamide 10 cwt
(NB —The dark patch in the foreground is due to
shadows not weeds)

NOTES FOR THE MONTH

infested with chickweed, and growers who have had experience of this weed will realize the difficulty involved in keeping it within bounds. Asparagus presents difficulties during the cutting season, as the hoeing of the actual rows of plants becomes impossible. Failing the possibility of using some other means, the expensive method of hand weeding becomes essential.

A plantation of some 5 acres of asparagus was put down in the spring of 1933 in the Lane Field on the Kirton Agricultural Institute farm. The land is light silt, which should be very suitable for asparagus, but it is seriously infested with chickweed—a fact that caused some concern at the time when it was decided to use this field for the asparagus plantation.

American work on the use of calcium cyanamide as a means of control of annual weeds in asparagus plantations during the cutting season was brought to notice, and it was decided to experiment on similar lines. Though no cutting was done during the past season, the plantation being only in its second year, plots were laid out and dressings applied as outlined below.

The plantation is laid out in single rows at $4\frac{1}{2}$ -ft. intervals, this system being adopted to permit of the use of horse labour as much as possible. The plots were laid out 3 links wide by 83.3 links long, giving a dimension of $\frac{1}{400}$ of an acre. The width used covered all the area that would be involved by the growth of the crop, and that could not be hoed during the cutting season. The following treatments were used, in duplicate:—

1 & 1A.	No treatment, control. These plots were not weeded at all until after the effects of treatment on the other plots had been definitely ascertained.				
2 & 2A	Calcium cyanamide at the rate of 1 cwt. per acre.				
3 & 3A.	do.	do	do.	3	do.
4 & 4A.	do.	do	do.	6	do.
5 & 5A.	do.	do	do.	10	do.

The dressings were applied on April 28; growth of asparagus was beginning at this time. The rows were clean following the use of the hoe. The soil was wet when the dressings were applied, and heavy rains fell immediately afterwards.

The control plots, 1 and 1A, became heavily infested with chickweed and other weeds, and this condition applied also to plots 2 and 2A, which received a small dressing of cyanamide. On plots 3 and 3A, receiving 3 cwt. cyanamide per

NOTES FOR THE MONTH

acre, partial control of the weeds was noted, whereas on plots 4 and 4A, 5 and 5A, complete control of the weeds was obtained and continued over the whole period that would have been the cutting season for a fully established crop. No weeds appeared. The period in question was a dry time. Similar results might not be obtained in a wet season, when effects of the cyanamide might not be so persistent. The growth of the asparagus was not affected. The accompanying photographs clearly illustrate the position.

In a supplementary experiment weeds were allowed to grow strongly on the asparagus rows, and calcium cyanamide was applied on plots of the same size in similar dressings as in the main experiment. The dressings were applied in mid-June. The weed growth on these plots consisted of chickweed, annual nettles and fat hen, the chickweed being abundant and very strong. The two light dressings of cyanamide (1 and 3 cwt. per acre) showed heavy scorching of the chickweed, and slight scorching of other weeds. The heavy dressings of cyanamide gave complete control of chickweed and drastic scorching of the other weeds.

The financial aspect of the treatment is as follows:—The minimum effective dressing was 6 cwt. per acre of land planted with asparagus. As only the actual rows were dressed, the quantity of calcium cyanamide used per statute acre was about 3 cwt. At £8 per ton for the material the cost per acre was 21s. 6d.

Complete control was obtained over the length of the cutting season. In the absence of treatment, hand-weeding would have been required several times during the period, and this at a season of the year when labour is not too plentiful.

It was not observed that the cyanamide had any effect on the growth of the asparagus, but this point is not being overlooked.

Maize

THE world trade in maize is the subject of a recent report by the Imperial Economic Committee.* On account of restrictions and regulations in many importing countries, trade in maize, as with many other commodities, is made

* Maize. Being the 28th Report of the Imperial Economic Committee. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, Price 1s., post free, 1s. 1d.

NOTES FOR THE MONTH

difficult; on the other hand, the world market is not overshadowed by large accumulated stocks as with wheat. Although world production of maize and wheat are about equal, the international trade in maize attains only about two-fifths of the volume of that in wheat and wheat flour. The reason is that in the United States, which produced some 60 per cent. of the world's crop in 1932, maize is grown almost entirely for home consumption, about 85 per cent. of the crop being used for live stock, pig feeding alone accounting for 40 per cent. of it. Exports from that country in recent years totalled only about one-quarter of 1 per cent. of the crop, and in 1932 amounted to only 2 per cent. of world trade in this grain.

Over four-fifths of the maize entering into international trade comes from Argentina and the Danubian States, the former country, which exports more than 80 per cent. of its production, accounting for two-thirds of the trade from a crop that is only about one-tenth of that of the United States.

Europe is the largest market for maize, and the United Kingdom is the principal buyer. About 80 per cent. of the imports into this country come from Argentina, which produces mainly the small yellow variety preferred by poultry keepers, who buy about one-half of the total quantity imported. The maize chiefly grown in the principal exporting countries of the Empire—such as the Union of South Africa, Southern Rhodesia and Kenya—is a flat, white grain, preferred by manufacturers of maize products in the United Kingdom, who are mainly interested in the production of edible maize starch for use in such articles as cornflour and custard powder; maize products for industrial purposes, such as the finishing of textiles and laundry use, are mainly imported. In recent years, up to 90 per cent. of the consumption of these manufacturers has been of the Empire flat white maize, for which they are willing to pay a premium, provided that it is not too high. Whisky distillers and makers of glucose also prefer this variety.

It is important to Empire countries to maintain and extend the market they now have with manufacturers, although this is comparatively small. The main demand, however, is for poultry food, and the entry of Empire supplies into this market, in direct competition with Argentine maize, would necessitate the production of a grain resembling that of Argentina, or a change in the present

NOTES FOR THE MONTH

preference for it as the result of well-established trials and publicity.

Damage to Wool from Colouring Matter in Sheep Dips

THE Ministry is advised that, during the last five or six years, quantities of wool have been coloured with a substance that causes the wool to become a brilliant orange yellow when scoured. Analysis of this colouring matter, by the Wool Industries Research Association, shows that it is a substance known as Metanil Yellow, which may be a component of some dips, or may be an added substance for the purpose of giving bloom to the wool. This substance is a dye-stuff with a strong affinity for wool; and the colour thus given to the wool cannot be removed in the course of the ordinary commercial processes. The value of the wool for manufacturing purposes is, therefore, depreciated. In these circumstances, farmers are strongly advised to avoid the use of dips or washes which may contain this substance.

The Maynard Ganga Ram Prize

As notified in the issues of this JOURNAL for April and October, 1933, the above Prize was offered for a second award, competitors being invited to send in their entries by December 31 in that year. The Ministry has been informed that none of the entries received was considered of sufficient merit; and the Managing Committee of the Prize has, therefore, decided that the award should be postponed for a year, and now invite further entries, which should be addressed to the Director of Agriculture, Punjab, Lahore, India, and dispatched to reach him on or before December 31, 1935.

The Prize was founded through the generosity of the late Sir Ganga Ram, C.I.E., M.V.O., R.B., who handed to the Punjab Government a sum of 25,000 rupees for its endowment. Of the value of 3,000 rupees, the Prize is to be awarded, every three years, for a discovery, or an invention, or a new practical method that will tend to increase agricultural production in the Punjab on a paying basis. The competition is open to the whole world; and Government servants are eligible to compete.

MASTITIS IN DAIRY COWS AND ITS CONTROL

A. W. STABLEFORTH, D.Sc., M.R.C.V.S., D.V.S.M.,
*Research Institute in Animal Pathology, Royal Veterinary
College, London.*

THE purpose of this article is to provide a concise general review of our knowledge of udder diseases, to draw attention to their wide prevalence, and to outline the measures that may be taken to prevent their spread and to reduce their ill effects.

Udder diseases are of outstanding importance to the cattle owner generally, and particularly to the dairy farmer working on an intensive scale or for milk records. They are undoubtedly the source of great annual loss, and where efforts—often costly in personnel and purchase of high-quality stock—are being made to improve methods and production generally, these diseases may make all the difference between profit and loss. They may be acute or chronic. The loss from the acute forms is itself considerable, but of greater importance, in the aggregate, is the serious loss incurred in keeping animals affected with the widespread chronic form of the disease.

The Term "Mastitis."—"Mastitis" means literally inflammation of the udder and will, therefore, include cases that show the ordinary signs of inflammation, i.e., heat, swelling or pain, or in which the milk is clotted or otherwise strikingly altered. For such cases the popular terms are "Garget," "Weed," etc. Really the term "mastitis" means more than this; it should include all kinds of infection of the udder, irrespective of their severity. Actually at a given moment, the alterations in the udder or milk may be so indefinite that special methods are necessary to reveal them. It is, nevertheless, obvious that these *hidden infections must be considered*, not only because they *can* be detected by proper methods, but also because there is unquestionable evidence that they *do* become more marked, leading to easily recognizable disease. Further—what is the most serious point—the disease is contagious, and therefore, during the whole of the time, the infected animal is a source of danger to other animals which may show the disease in a more obvious form.

NOTES FOR THE MONTH

The Causes of Mastitis.—It is generally agreed, at the present time, that mastitis is due to the activities of germs or bacteria, of which a teaspoonful of milk may contain thousands or millions. These bacteria are of different kinds, and the symptoms of the disease vary accordingly. Some cause an acute type of disease with heat, pain and swelling, and rapid loss of the quarter or quarters. Others cause a progressive, cold type of inflammation, characterized by a gradual hardening of the affected quarter. Still others cause a widespread form that is chronic and that may extend over one or more lactations and show different symptoms at different times, depending on certain auxiliary factors.

Auxiliary and Predisposing Factors.—By this is meant outside factors that assist development of the disease. The most important of these are overstocking and incomplete emptying of the udder, particularly towards the end of lactation. This is well shown by the fact that cows that will not give down the last strippings, so-called "strippy" cows, show obvious symptoms of mastitis more frequently and severely than other infected cows. Chills, and possibly injury to a sensitive gland, such as injury caused by rough milking or by other external factors, are also of importance. These factors are all often included under the term "predisposing causes." It ought to be emphasized, however, that they are secondary and, although not to be neglected, are of minor importance, except in an infected udder. Other factors, which may be regarded more truly as predisposing, are injuries amounting to actual breaks in the skin of the udder or teats. These may permit infection of a previously healthy udder.

The Various Kinds of Mastitis and their Symptoms:
Streptococcus Mastitis.—This form of udder disease is by far the most widespread and accounts for a very large proportion of cases of mastitis in milking cows. It is caused by streptococci, small, spherical bacteria that grow in "chains." It is usually chronic, slow in development, and may continue over several lactations, but it may be of a more acute nature or spread quickly through the whole herd. More often, however, infection occurs some time before obvious symptoms are present. At first the symptoms may be comparatively mild, small clots in the first milk drawn being the only indication that the cow is infected, and, though perhaps perceptible to the milker, these clots are

MASTITIS IN DAIRY COWS

often disregarded and not in any way associated with "garget." It is, nevertheless, certain that these mild symptoms are part and parcel of the disease. When milk samples are taken periodically from the same quarter, the same causal germs can be isolated regularly and often in large numbers, and appropriate tests will nearly always show that inflammation is present. If an infected animal is regularly and completely milked, it may show no marked symptoms. Sooner or later, however, the symptoms become obvious. It is only when this happens that an infected quarter is generally recognized as a diseased quarter. The symptoms reappear with increasing frequency and severity as lactation progresses and as the animal gets older, until the milk-secreting tissue is destroyed.

Many cases are first noticed towards the end of a lactation. On the other hand, the disease may occur soon after calving, and there are instances where the majority of animals show severe symptoms within a few days of calving. Infection usually persists through the dry period, and no immunity is produced by an acute attack.

There is every reason to believe that streptococcus mastitis always originates from a previous case and that it is in most instances spread by the hands of the milker. It is not certain whether the actual route of infection is the teat canal or cracks and sores on the teats. This in no way, however, weakens the evidence against the milker who unwittingly spreads the disease, because the common variety of mastitis streptococcus does not live long outside the udder, and because infection cannot be produced experimentally by injecting the germs under the skin, or into the blood, or by drenching the animal with them.

The chronic streptococcus form of mastitis is of outstanding importance: (1) because it is widespread amongst milking cows, and its early stages are overlooked; (2) because its frequency and effects increase with age—animals of five or six years, which should be reaching the peak of their milking capacity, are far more frequently and seriously affected than younger animals; (3) because it is contagious and may, for reasons which are not yet certain, suddenly assume a severe form affecting a large proportion of the herd.

Staphylococcus Mastitis.—This form is caused by staphylococci, also small spherical bacteria, but which grow in clusters often likened to bunches of grapes. While the disease is relatively uncommon, it is acute, marked by a

MASTITIS IN DAIRY COWS

strong tendency to sloughing of the affected quarter, and is not infrequently followed by the death of the animal from poisons absorbed into the blood.

Summer Mastitis.—This form is so called because it is prevalent in the warmer months of the year. It chiefly affects dry cows and heifers at grass, and is, in some countries, therefore called “pasture mastitis.” It is caused by a small germ known as the *bacillus pyogenes*. The disease is somewhat chronic in its course and is associated with suppuration of the affected tissue and a particularly foul-smelling, greenish-yellow or blood-stained pus-like secretion. The quarter does not slough off, but is nearly always lost and the animals fall away heavily in condition. Abscesses may form and break externally. Summer mastitis is fairly widespread and in certain herds may affect a large proportion of the dry cows and be of serious economic importance. It seems, however, to vary in its incidence, being almost absent in some years. The causal organism probably never grows outside the animal body, but may live outside for a considerable time. The method of spread is not certainly known; it cannot be the milkers’ hands because the teats of many of the animals have never been handled. Flies are often regarded as of importance, and agents such as tar oil may be used to repel them. Attempts may also be made to seal the teats with collodion or some similar adhesive. Antiseptic injections are also used. Heifers or dry cows at pasture should be examined regularly in order that, where necessary, appropriate measures may be taken promptly.

Tubercular Mastitis.—Tubercular mastitis is of the cold type characterized by a gradual hardening of the affected tissues, more often the upper part of the hind quarters of the udder. The milk is unaltered at first but later becomes whey-like and contains clots. It is the classic example of a form of mastitis in which the infection spreads from earlier centres of disease within the body of the affected animal. For this reason, the problem of its prevention is bound up with that of tuberculosis and will not be further considered here. The disease owes its importance to the danger of using milk from infected quarters for infant feeding or for feeding young animals, unless the tubercle germs have been destroyed by pasteurization or boiling. At the present time, over 4,000 children are infected with tuberculosis every year in England and Wales through the medium of raw milk

MASTITIS IN DAIRY COWS

containing tubercle bacilli from cows, and it is certain that large numbers of calves and pigs are infected in the same way.

Other Forms of Mastitis.—Mastitis may also be occasionally caused by *B. coli*, or by yet other bacteria. Such infections, however, are rare, and do not merit further mention here.

Incidence and Importance.—The factors that make mastitis of importance are:—

(1) Occasional loss of the cow from acute mastitis.

(2) Loss of the quarter, which, in some forms occurs quickly, in others after the disease has run a chronic course.

(3) Lowered milk yield from the widespread chronic form and the consequent necessity for keeping a larger number of cows than would otherwise be required to produce a given quantity of milk.

(4) Increased herd wastage incurred by the sale of unprofitable cows.

(5) The changes caused in the milk of infected animals, viz., decreased casein, decreased fat and sugar content, increased alkalinity and salt content. These changes are well recognized and may make the milk unsuitable for dairy purposes, e.g., cheese-making.

(6) Reference should also be made to the fact that, although ordinary mastitis streptococci are without danger to human beings, mastitis is occasionally caused by streptococci from a human source. The milk will then prove an extreme danger to those who drink it in the raw state. Investigations should be made at once when circumstances suggest a connexion between outbreaks of septic sore throat or of scarlatina, and milk. Milk from cows infected with contagious abortion may also be the source of undulant fever in human beings.

Some idea of the widespread nature of udder disease may be gathered from the figures collected in this and other Institutes. These figures are based on the examination of milk samples from many thousands of animals and show that it is unusual for a herd to be free from mastitis. Most herds contain from 10 up to 80 per cent. of infected animals, the lower figures being obtained generally in small herds of young cows. The average percentage of infected animals is between 30 and 40, and these animals are, on an average,

MASTITIS IN DAIRY COWS

affected in two quarters. It must be emphasized, however, that only some of these animals show obvious disease at any given time; the proportion varies greatly.

As regards the average loss in milk from mastitis, it has been ascertained, by comparison of the milk yields of approximately equal numbers of clean and infected animals in a herd of about 100 Friesian cows, that the average decrease of milk due to the disease was not less than 100 gal. per cow per lactation. Included among the infected cows were some that had lost a quarter owing to summer mastitis, but in most instances the cows were not suffering from mastitis that was obvious on ordinary inspection.

Prevention and Control.—This part of the subject may be considered under three headings:—Vaccination, treatment by injection of chemical substances, and measures based on segregation of infected animals and improved hygiene.

1. *Vaccination.*—As in other diseases in which a definite bacterial agent has been incriminated, so in mastitis attempts have been made to prepare vaccines with the object of prevention or cure of the disease. Unfortunately, it must be concluded that vaccines are of little value either as preventives or curatives. It is true that apparently good results have in some instances followed their use; but where, under experimental conditions, sufficient unvaccinated animals have been available for comparison, it has not been possible to show that vaccines were of any definite value. That applies not only to stock vaccines of the commercial type, but also to autogenous vaccines, i.e., vaccines specially made for each herd, from the germ found in that herd. Attempts are still being made to produce a vaccine of value, but at present we must turn to other methods of combating mastitis.

2. *The Injection of Chemical Substances into the Udder.**
—Attempts to cure mastitis by the injection of chemical substances into the udder through the teat canal have also received considerable attention, efforts being usually confined to the cure of mastitis that had already reached an

* Treatment by the injection of chemical agents by way of the teat canal requires considerable discretion, and the most suitable method in any given case can best be decided by the usual veterinary attendant, who can also best advise on treatment in general. The success or failure of treatment can only be decided by a subsequent laboratory examination of milk samples.

MASTITIS IN DAIRY COWS

advanced stage. The treatment of such cases has given very variable results, depending to some extent on the stage to which the disease had progressed before the treatment was applied, and no chemical substance has yet received general approval. It is, for obvious reasons, useless to hope that a quarter in which destruction of the milk-secreting tissue has taken place, can be made to produce a normal quantity of milk again. The object of injecting chemical substances into the udder is to destroy the causal organism. It is reasonable, therefore, that such measures should be used at as early a stage of the disease as is practicable.

After a complete herd examination has been made, the question has often been asked whether anything can be done with the infected animals that are at an early stage and showing little or no obvious clinical signs of disease.

Further study of this point is in progress, but it can be said that there is already evidence to indicate that many such infections can be eliminated by means of udder injections. It is hoped that in the near future the common form of mastitis may be attacked by the combination of measures designed to prevent spread of infection with treatment of those animals already infected. Treatment by means of udder injections, however, inevitably causes definite disturbance in the udder, and the milk is altered for several days, while the yield does not return to normal for about a week. To avoid this, treatment may be delayed until the cows are drying off, but, unfortunately, the treatment must then be more severe, and the effects of this are not yet sufficiently known.

It is thus obvious that the treatment of infected quarters in the early stage must be attended by some loss of milk, whilst in the later stages of the disease treatment can only be partly, if at all, effectual. There is, therefore, every reason to prevent new infections from arising. This can only be done by applying methods that will detect the infection at an early stage and by the subsequent application of suitable control measures.

3. Segregation of Infected Animals and Improved General Hygiene.—Although the only satisfactory method of dealing with the disease is one based on laboratory examination of milk samples, something may be done, by attention to certain general principles, to limit the spread of infection from cow to cow, and to reduce the development of clinical disease. Animals that show any changes in the

MASTITIS IN DAIRY COWS

milk or other signs of udder disease should be dealt with by a special attendant, or if that is impossible, the teats should not be handled until after the normal animals have been milked. Fore-milk, or pus-like discharges, should not be milked on to the floors but collected in special vessels and destroyed. Cloths that have been used for cleaning diseased udders should never be used for healthy ones. Milkers should wash their hands frequently, and, where practicable, before milking each cow. Teat syphons, where used at all, should be sterilized; straws should never be used. All cows should be carefully and thoroughly milked, particularly towards and during the drying-off stage; and especially if at all "strippy," or if they have at any time shown flakes or clots in the fore-milk, or any other abnormality. Injuries, cracks or sores on the udder or teats should be avoided as far as possible and treated promptly, whenever they occur. Milking machines should only be used for healthy animals; and all animals should be stripped by hand. In addition, cows and their standings should be kept clean and frequently disinfected, attention being paid to feeding and general conditions. It should also be borne in mind that older cows are far more frequently affected than younger ones, and, where the exact state of the udder has not been determined by laboratory examination, it is advantageous to milk apparently normal animals in order of age.

The Feeding of Mastitis Milk to Calves and Pigs.—Milk that contains large numbers of mastitis streptococci and which may or may not be changed in appearance is frequently fed to calves or pigs without obvious ill effect.

The question is often asked, however, whether such milk may not produce infection of the calf with a consequent development of mastitis later. In view of the well-established fact that, even in badly infected herds, the majority of heifers are free from infection and that drenching of cows with large numbers of mastitis streptococci fails to produce mastitis, it may be concluded that there is no evidence of danger from this source.

Aids to the Detection of Mastitis on the Farm.—A useful procedure is to keep a list of cows arranged according to age, and to note down *every* abnormality in the udder or milk, as observed. Short of a laboratory examination, some help in detecting infected quarters at an earlier stage

MASTITIS IN DAIRY COWS

than would otherwise be the case, can be obtained by keeping a sharp look-out for a fall in yield in one or more quarters, and by examining the fore-milk carefully for small clots or flakes or for increased alkalinity. Flakes or clots are more easily seen on a dish with a blackened surface, and special "strip-cups" are made for the purpose. The alkalinity that is frequently found in mastitis milk can often be detected by means of papers specially prepared for the purpose with a dye known as brom-cresol-purple. These papers are yellow before use; milk of normal alkalinity produces a slate-grey colour, whilst a purple colour, except in a freshly-calved or nearly dry cow, indicates mastitis.

These tests are of value if positive. The milk from infected udders, however, varies from day to day in its alkalinity or in the presence of flakes and clots, and may be normal at the time of test. Such methods will miss many infected cows, especially if used once or twice only. The maximum benefit from these tests can only be obtained by repeating them at short intervals.

Building up of Mastitis-free Herds.—The building up of a mastitis-free herd must be based on recognition of three facts, viz., (1) that mastitis is contagious, (2) that many apparently normal animals are infected and, therefore, a danger to clean animals, and, (3) that the disease is spread, though unwittingly, by the hands of the milker.

The first step in any real attempt to build up a mastitis-free herd must, therefore, be to pick out not only advanced cases, but also those that are not suffering from obvious disease. This can only be done in a laboratory suitably equipped and experienced in such work. The second step must be to use all practicable precautions to prevent the spread of infection to healthy udders.

Infected cows should be milked last or by a separate cowman. A further precaution, that some owners find it possible to take, is to put the infected and non-infected animals into different cowsheds. Attention should, of course, also be paid to the precautions mentioned under general improved hygiene. If it is desired to milk the infected section by machine, a special unit should be reserved for it. Badly-infected animals should be disposed of as soon as possible. Animals that are in the early stages and still profitable should be kept, but every care must be taken to prevent clean animals from becoming infected

MASTITIS IN DAIRY COWS

from them. Additions to a clean herd should always be carefully examined, and their milk should be sent to a laboratory for examination. It is definitely advantageous to buy heifers or at least young cows, because the chance of older cows being infected is greater.

Protection of Heifers from Infection.—Emphasis may well be laid on the fact that nearly all heifers are uninfected and that it is not a difficult matter to protect them from infection and so build up a clean herd of young cows. In fact, owners who feel that they cannot have their whole herd examined would achieve a great deal if they paid attention only to their heifers and made an endeavour to protect them from infection by milking them first or separately, or, wherever possible, by putting them into a separate cowshed or at one end of the common shed. It would, of course, be necessary to examine milk samples from each animal, one or two weeks after calving, in order to pick out the occasional heifer that is infected, and, as a further precaution, to re-test the heifer section of a herd after three or four months and at increasing intervals afterwards.

The Collection of Milk Samples for Examination for Mastitis—When milk samples are taken for examination for mastitis it should be borne in mind that they are for bacteriological examination, and that contamination from outside may make the examination useless and render another collection of samples necessary. Corks should never be held in the mouth nor put on the floor, nor should tubes be opened until required.

Milk samples for mastitis examination should consist of *fore-milk*, but should *not include* the *first few streams* because these are usually contaminated.

Before samples are taken the udder and especially the teats should be cleaned as thoroughly as possible by washing, or wiping with a clean, wet cloth.

Sampling can be done by the milker alone but, where possible, should be carried out by two persons. One of these takes the samples, while the other is responsible for marking the tubes and handing each tube to the sampler when he is ready, and for ensuring that it is filled with milk from the proper quarter.

Quarter Samples.—(Samples from each quarter should always be sent unless mixed samples are asked for by the laboratory concerned.)

- (1) The sampler draws the first few streams into a bucket or other vessel for disposal. The assistant marks the tubes.
- (2) The assistant takes one tube, and, holding it upside down, removes the cork by its exposed part, which he holds until it is replaced after the tube has been filled. Still holding the tube upside down, he hands it to the sampler.
- (3) The sampler, when ready, turns the opening of the tube up just sufficiently to direct the stream of milk on to the inside of the tube. (These precautions prevent dust from falling into the tube, and prevent frothing.)

MASTITIS IN DAIRY COWS

- (4) The tube is filled with milk (not froth) nearly to the level of the cork.
- (5) The tube is returned to the assistant, who replaces the cork at once, making sure that it does not slip out. Corks will not slip out if the tubes are not overfilled and are allowed to stand upright until the milk has cooled.
- (6) The other quarters are sampled in turn.
- (7) The samples are set upright in a cool place until dispatch.

Mixed Samples.—When mixed samples are being taken the tubes should receive an approximately equal quantity of milk from each quarter.

The sampler must milk dry-handed and preferably by squeezing, not by drawing or stripping. The tube must not touch the teat. If the milking hand becomes wet, it should be washed before another cow is sampled.

Sending of Samples.—Samples should be sent by the first available train marked "Glass with care," "Urgent (to be called for)," and the laboratory notified in order that they may collect them at once.

In certain cases, other means of conveyance may be quicker than train. Post may be used for small numbers of samples.

YIELD RESULTS FROM CHILLED SEED POTATOES

E. R. WALLACE, M.A., Dip. Agric. (Cantab.),
Agricultural Institute and Experimental Station, Kirton.

Introduction.—Potato growers who have raised crops from "seed" that has been on rail during cold spells, or has otherwise suffered exposure to low temperatures, have often been led to suspect damage to the vitality of the plants produced, as reflected in both top-growth and final yield, where it has appeared possible to rule out the action of other detrimental factors. The idea follows naturally from the observation that tubers are killed by freezing under exposures sufficiently severe. From this it is but a short step to suppose that milder exposures might result in damage to the tuber affecting its subsequent growth, without necessarily causing any death of tissue or any other visible changes by which such damage might be detected.

In 1932, it was decided that experimental evidence on this point should be sought by carrying out a yield trial with chilled seed at Kirton, this being rendered possible by the co-operation of the Director of the Low Temperature Research Station, Cambridge, who placed all facilities for chilling the seed at the writer's disposal.

The information sought was purely empiric and no attempt has been made to link up the observations made with any facts relating to the physiology of the potato tuber at low temperatures. Only two factors defining the conditions of exposure were considered—temperature and time. These each afford a continuous range, and it was, therefore, necessary to select a series of exposures sufficiently few in number to form the basis of a yield trial, whilst aiming at efficient exploration of the field of inquiry. Since the practical issue involved is one of damage in transit, especially within Great Britain, or of damage overnight in the glasshouse, the time factor was to be measurable in hours rather than days. (The effects of prolonged storage at low temperatures have been dealt with elsewhere ^{2, 4, 5 & 6.*}) Temperatures above 1° C. were not considered, since it was

*.For references, see page 964.

YIELD RESULTS FROM CHILLED SEED POTATOES

known that night temperatures of this order obtain frequently in the chitting houses even when the usual protective measures are practised. A lower limit was set from consideration of the minimum air temperatures observed in this country, supplemented by results with some small samples of King Edward tubers, obtained in December, 1931, and January, 1932, at the Low Temperature Research Station (Table I). For these, and for valuable criticisms and suggestions, as well as for his continued assistance with this part of the work, the writer is indebted to Dr. J. Barker.

TABLE I.

<i>Temperature.</i>		<i>Degrees of Frost, F.</i>	<i>Hours' exposure.</i>								
<i>°C.</i>	<i>°F.</i>		$\frac{1}{2}$	1	$1\frac{1}{2}$	2	3	8	12	24	48
-1	30.2	1.8	—	—	—	—	—	—	—	—	N
-3	26.6	5.4	—	N	—	—	N	N	V	V	V
-6	21.2	10.8	—	N	—	N	V	V	V	V	—
-10	14.0	18.0	N	N	N	—	V	—	—	—	—

N.—No visible injury.

V.—Injury producing visible symptoms.

Experimental.—In January, 1932, eleven batches of King Edward seed, each of 250 tubers, were subjected to chilling as shown in Table II. The tubers were placed in shallow paper-lined wooden trays, three to each batch, placed one above the other in the cold chambers. Other details are given in the table, the periods of exposure being the actual time during which the tubers were left in the chambers. No attempt was made to check the rate of cooling down from the original temperature in the different batches.

Once during each exposure, the three trays, with an empty tray on top, were shaken together with an up-and-down movement. The jarring received, while insufficient to cause any bruising, serves to determine the formation of ice-crystals where super-cooling has taken place, a contingency normally ensured by vibration in transit. The formation of these crystals in the intercellular spaces, and the necessary abstraction of water from the cells, afford the clearest definition of what constitutes "freezing" of either the whole or part of the tissue of a tuber. Their presence in quantity can be detected by the crackling heard if a frozen tuber is held close to the ear and rolled gently between finger and thumb.

At planting time (March 24) a large proportion from the

YIELD RESULTS FROM CHILLED 1932 POTATOES

TABLE II.—OBSERVATIONS ON CHILLED TUBERS, 1932.

958

Treat- ment °C. No.	°F.	Degrees Hours of Frost. sure.	Formation of Ice Crystals.	Examined Jan. 27. 20 tubers sectioned.	Small sample kept at room temperature until Feb. 19.	
1.	1	33 8	—	48	No change.	Sound and sprouted. No internal discolora- tion.
2.	-1	30.2	1 8	24	Out of 20 tubers 12 slightly softer than No. 1. Slight traces of shrinkage.	Ditto.
3.	-1	30 2	1 8	48	4 out of 20 tubers soft. Doubtful traces of shrink- age in one tuber. No exudation or primary discoloration.	Ditto.
4.	-3	26 6	5 4	3	No change.	Ditto.
5.	-3	26.6	5 4	8	No change.	Ditto.
6.	-3	26.6	5 4	12	Shrinkage in certain tubers below restricted areas of the surface. In 4 out of 20 tubers internal discoloration in the form of bluish-grey patches. No exudation or externally visible discoloration.	Ditto, but weaker sprout formation than above.
7.	-3	26.6	5 4	24	Local shrinkage in some tubers associated with blackening below. Out of 20 tubers 16 dis- played bluish-grey discolorations. No exuda- tion.	Ditto.
8.	-3	26 6	5 4	48	All sample much softer than Nos. 1-6. In 7 tubers out of 20 black discoloration visible ex- ternally beneath the skin, associated with exudation. Internal discoloration various, but less extensive than in No. 10. Next day the whole of the cut surfaces in this and the No. 11 sample had turned black.	4 soft, smelling. 1 sound, sprouted.

TABLE II. RESULTS FROM CHILLED SEED POTATOES

TABLE II (contd.).

Treat- ment °C. No.	°F.	Degrees Hours of Expo- sure.	Formation of Ice Crystals.	Examined Jan. 27. 20 tubers sectioned.	Small sample kept at room temperature until Feb. 19.
9.	-6	21.2 10.8	3 Crackling	Sample soft. Out of 20 tubers 9 showed shrinkage as in No. 10. Exudation from a crack in one. Two types of primary internal discoloration: (a) brown irregular boundaries to greyish injured areas, (b) browning along vascular ring with dark areas adjacent. Next day potatoes apparently hardening again.	All soft, smelling.
10.	-6	21.2 10.8	8 Crackling	Marked shrinkage. In 12/20 tubers local, in form of irregularly shaped depressions, usually less than 1 cm. wide and 1-3 mm. deep. In two other tubers shrinkage general associated with wrinkling of skin. Softening and cell destruction very marked in one tuber and another completely collapsed. Internal discolorations of various types. All tubers showed discoloration.	3/10 soft, rotted, 2 sound with small sprouts but showed discoloration along vascular ring.
11.	-6	21.2 10.8	12 —	On removal all the treated tubers were soft, exuding liquid. About half were softer still and wet all over. On 27/1 when a sample was examined with the others, some tubers had already become harder again. Black discolorations were visible externally but no other local effects. Blackening of all cut surfaces observed next day	4 soft, rotted. 1 firm, but no sprouts.

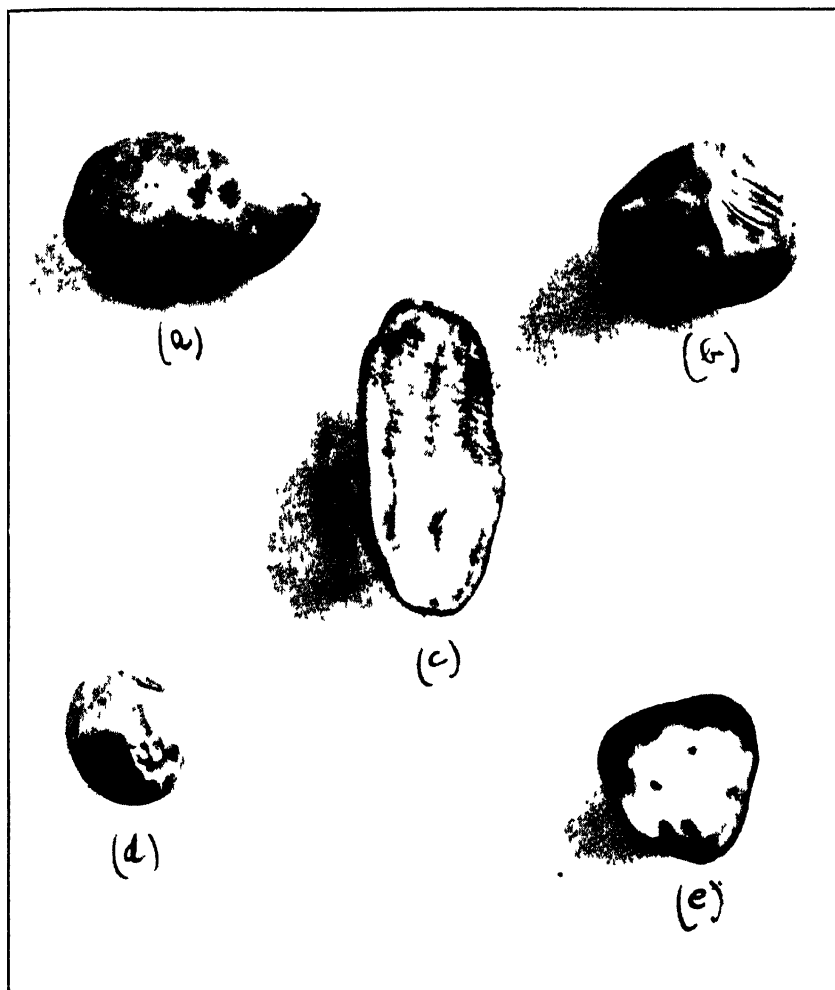
YIELD RESULTS FROM CHILLED SEED POTATOES

treatments numbers 8, 10 and 11 had rotted. Two hundred tubers from each of the remaining lots were planted in five randomized blocks of nine single-row plots, each of forty tubers, including a control that had travelled with the rest.

The crop was grown on medium silt soil, following seeds. Ten tons per acre of farmyard manure had been applied on the seeds aftermath that was ploughed in. In addition, the whole field was dressed about 14 days before planting with 8 cwt. per acre of drained creosote salts and received $10\frac{1}{2}$ cwt. per acre of a maincrop artificial manure mixture.³ The average yield from these plots was low for the variety on this type of land, being approximately $7\frac{1}{2}$ tons per acre, and the experimental error at 15.9 per cent. was high. One treatment, 3 hours at -3°C. , gave a yield significantly below all the rest. The control plots showed the next lowest average yield, this being below the averages from all the other treatments, but no further significant differences were demonstrable. This must be attributed to some other detrimental factor at present unascertained, since the average yield from the controls alone was well below that of the commercial crop grown in the same field from the same stock of King Edward seed. The foliage of the growing plants of all treatments, and including the controls, was definitely inferior to the foliage of the rest of the field.

It was decided to carry out a similar experiment in 1933, incorporating a second series of controls planted from seed of the same stock retained at Kirton. In 1932, the seed had travelled to and from Cambridge by passenger train in small sacks packed in a wooden box; in 1933, double sacks were used, packed in pairs in large sacks, and the transference between trains was supervised.

The treatments are shown in Table III, together with observations made on samples from the treated batches. The various forms of injury noted are not detailed, being of the same types as those recorded in the 1932 experiment. Three hundred tubers were available for each treatment, thus allowing a better margin to cover wastage from such sources as Dry Rot, etc. The treatments were given on January 25 and 27. Ten tubers from each lot were sectioned on January 30, and the appearance of these is given in Table III. The tubers were transferred to chitting boxes, together with the controls, and left to sprout. The lowest temperature recorded in the glasshouse during the period was 0°C. on February 20. On February 21, fifteen



Copyright E R Wallace

Types of low temperature injury (a) and (d) localized shrinkage (b) general shrinkage (c) browning along vascular ring (e) dark patches across vascular ring sometimes reaching the surface

YIELD RESULTS FROM CHILLED SEED POTATOES

Go face page 960.

YIELD RESULTS FROM CHILLED SEED POTATOES

TABLE III.—OBSERVATIONS, 1933, AND SYNOPSIS OF YIELD RESULTS.

Treat- ment No.	°C.	°F.	Degrees of Frost.	Hours Exposure.	Formation of Ice Crystals.	Visible Injury.	Yield Results. Reduction compared with Control No. 10.
1	—1	30·2	1·8	40	No cracking	No change	Significant.
2	—3	26·6	5·4	2½	No cracking	Doubtful	Not significant.
3	—3	26·6	5·4	5	No cracking	Internal, slight	Significant.
4	—3	26·6	5·4	10	No cracking	Internal in 3-10	Significant.
5	—3	26·6	5·4	20	Cracking observed	Doubtful in one tuber	Significant.
6	—3	26·6	5·4	40	Cracking observed	Pronounced and external See Fig (a), (c)	Significant.
7	—5	23·0	9·0	3½	No cracking	Doubtful in one tuber	Not significant.
8	—5	23·0	9·0	5	No cracking	Internal in 3-10	Significant.
9	—5	23·0	9·0	10	Cracking observed	Pronounced. External in 8-10 See Fig. (b)	Significantly below all others.

YIELD RESULTS FROM CHILLED SEED POTATOES

soft rotten tubers were removed from No. 9 and three from No. 6. Four more were removed from No. 6 on February 24. At the time of planting, April 13, all the tubers had sprouted, but no differences were observable between the sprouting of the different batches.

The lay-out was a slight enlargement of the previous year's plan, consisting of 5 randomized blocks of 11 single-row plots of 50 tubers. The spacing, as before, was 18 in. apart in rows 27 in. apart.

On July 3, an attempt was made to assess the growth of the tops as judged by eye, by allotting marks out of ten on the general appearance of each row. These averaged out as follows:—

Plot No. 9, 6; Plots Nos. 1 to 8, 7.6 to 8; Plot No. 10, 9.2; Plot No. 11, 9.5.

These averages display the only comparisons that can be founded on consistent differences in the marks awarded to separate plots. The difference between the whole series of plots from treated seed and the two control series was very clear, as also was the effect of the most severe exposure.

Potato blight was not observed and no fungicidal dusting was carried out on these plots.

Two blocks were ploughed out on October 26, and, bad weather intervening, the remaining three blocks were lifted by hand on October 28. The produce from each row was separated on a 1½-in. riddle and weighed in two parts, observations being taken on the tuber-size of the sample, which was classed as good, fair or small. These records were found to be in very close accord with the order of the total weights. The analysis of the yield figures (total weights) is given in Table IV.

TABLE IV.

<i>Treat- ment number.</i>		<i>lb. Mean of 5 plots.</i>	<i>Tons per acre.</i>	<i>Percentage of Mean.</i>
1. Exposed at	-1°C. for 40 hours	102.4	11.80	99.3
2. " "	-3°C. " 2½ "	104.4	12.03	101.4
3. " "	-3°C. " 5 "	101.4	11.68	98.5
4. " "	-3°C. " 10 "	101.6	11.71	98.7
5. " "	-3°C. " 20 "	103.4	11.92	100.5
6. " "	-3°C. " 40 "	100.4	11.57	97.5
7. " "	-5°C. " 3½ "	104.2	12.01	101.25
8. " "	-5°C. " 5 "	99.4	11.45	96.5
9. " "	-5°C. " 10 "	86.8	10.00	84.3
10. Control.	Travelled with above	112.2	12.93	109.0
11. Control.	Tubers remained at Kirton	116.4	13.41	113.0
	Mean " "	102.9	11.86	100.0
	Standard Error of			
	a single plot	6.4568	0.7438	6.16
	S.E. of difference of two means	4.083	0.4707	

YIELD RESULTS FROM CHILLED SEED POTATOES

Discussion.—It will be noted that the yield from treatment No. 9 is significantly lower than that from any other. The other treatments have also given reduced yields as compared with those from the control tubers, which travelled with them, and of these reductions all except those from the two short-period exposures, Nos. 2 and 7, are shown to be significant. In general, the reductions show a tendency to be greater following increased severity of exposure, but this cannot be supported by any significant differences between the yield figures. These results are, therefore, in accord with the classification of the treatments according to top-growth, referred to above.

The reduction in yield from the tubers that travelled, as compared with that of the second control, which stayed at Kirton, is also noteworthy, though it does not reach a significant value.

The figures for yields of ware only (tubers not passing a $1\frac{1}{2}$ -in. riddle) were examined separately and found to support the same inferences.

Tubers can survive extensive partial freezing, followed by fairly rapid thawing of the affected parts, which later harden again if not attacked by parasites. The question of possible influence of the rate of thawing-out, as also of the rate of re-heating of tubers chilled but not frozen, has not been considered in this investigation, and might conceivably be of importance. It is the most difficult factor to allow for in the absence of data of the temperature sequences obtaining under practical conditions, e.g., in a railway truck in a siding during a cold spell.

Conclusion.—In view of the possibilities which this experiment was designed to test, the result of most importance is that derived from a consideration of treatments Nos. 1 and 5. Here the exposure of the seed tubers for certain periods at low temperatures, insufficient to cause any marked change in appearance, external or internal, has yet brought about a reduction of nearly 10 per cent. in the subsequent yield, while the reduction following some of the more severe exposures, causing well-marked visible changes, is of the same order and not significantly greater.

Acknowledgments.—In addition to acknowledgments in the text, the writer must record his indebtedness to Mr. J. C. Wallace, of the Agricultural Institute and Experimental Station, Kirton, who first

YIELD RESULTS FROM CHILLED SEED POTATOES

directed his attention to the problem; to Dr. H. G. Sanders, of the School of Agriculture, Cambridge, for suggestions as to the lay-out, and for checking the working-out of the results; and to Mr. W. Patchett for the photograph here reproduced.

REFERENCES.

- ¹ HEALD, F. D.: *Manual of Plant Diseases*. McGraw-Hill Book Co. 1933, pp. 171-177 and refs. pp. 176-177.
- ² HURST, R. R.: Dominion of Canada, Dept. of Agriculture. Report of the Dominion Botanist for 1930, p. 170.
- ³ KIRTON AGRICULTURAL INSTITUTE: Guide to Experiments and Demonstrations on the Institute Farm, 1932, p. 39.
- ⁴ PEACOCK, W. M., and WRIGHT, R. C.: Proceedings of the Potato Association of America, XIV, 1927, pp. 122-125. The storage of potatoes immediately after harvest.
- ⁵ *Ibid.* Pp. 126-130. The storage of cut seed potatoes.
- ⁶ *Ibid.* Pp. 131-136. Influences of different storage temperatures on dormant seed potatoes.
- ⁷ STUART, W., LOMBARD, P. M., and PEACOCK, W. M.: Comparative influences of different storage temperatures on weight losses and vitality of seed potatoes. U.S.A. Dept. of Agric., Tech. Bulletin No. 117, 1929.
- ⁸ WRIGHT, R. C., PEACOCK, W. M., and LOMBARD, P. M.: Influence of freezing of seed potatoes on viability and yield. U.S.A. Dept. of Agric., Tech. Bulletin No. 119, 1929.

CIDER ORCHARDING IN HEREFORDSHIRE

C. SAVIDGE,
Horticultural Instructor for Herefordshire.

FOR centuries past Herefordshire has possessed a distinguished reputation as an orchard county. Out of a total area of 436,218 acres now under cultivation, 20,149 acres are orchards and 1,265 acres under small fruits (returns for 1933). Of this acreage of total orcharding, the largest proportion comprises farm orchards, in which cider-apple trees are extensively grown.

We have no positive evidence when vintage fruits were first grown in the county. Henry of Huntingdon (1154), in describing a quarrel that arose at the Court of Edward the Confessor, between two sons of Earl Godwin, represents one of them as departing in a rage to Hereford, where his brother had ordered a royal banquet to be prepared. "There he seized his brother's attendants and cutting off their heads and limbs, he placed them in vessels of wine, mead, ale, pigment, morat and cider." That apple and pear trees existed here in the Middle Ages is proved by the record of an action for cutting down trees, tried at Hereford Assizes in 1292. In the *Herefordshire Pomona* (1876-1885) it is stated that according to Bishop Swinfield's Roll, fruit orchards as such did not exist during his tour of Herefordshire in 1289-90. The first authentic record of cider is in Wycliff's M.S. "Cider Bible" (now in Hereford Cathedral), a century later (1420). The passage in the 15th verse of the 1st chapter of St. Luke's Gospel, is thus given: "For he schal be gret bfore the Lord, and he schal not drinke wyn ne sider." Doubtless cider was the natural drink of the inhabitants of farmhouses and cottages long before that.

It is certain that at the beginning of the 16th century, local orchard conditions improved. Continental wars had succeeded civil strife; English orchards assumed national importance and were extended; meanwhile the making of cider and perry to replace foreign wines became a patriotic duty. It was, says Evelyn, "By the plain industry of one Harris, a fruiterer to King Henry VIII (1509-47,) that the fields and environs of about thirty towns in Kent only, were

CIDER ORCHARDING IN HEREFORDSHIRE

planted with fruit to the universal benefit and general improvement of that county to this day: as by the noble example of my Lord Scudamore (c. 1630-50), and other public-spirited gentlemen in those parts, all Herefordshire is become in a manner but one entire orchard." At the end of the 16th century, during the reign of Elizabeth, old Gerarde in his *Herball* (1597) says: ". . . I have seen in the pastures and hedgerows . . . two miles from Hereford . . . so many trees of all sortes that the *servants* drinke for the most part no other drink but that which is made of apples."

To what extent Herefordshire fruit extended, and was appreciated during the 17th century progression period, we gather from the many works of the period. Poets and writers vied with each other in prose and verse their esteem of the county's products. Tusser began in 1620 in his "Points of Good Husbandry," followed by Parkinson in 1629. Evelyn follows with his "Pomona" in 1664; Beale a year later; Worlidge next in 1675; and finally Phillips, the Herefordshire poet, with his famous poem on "Cider" in 1700. Dr. Beale, writing in the time of the Commonwealth (1656) in his tract, "Herefordshire Orchards, a pattern for all England," an epistolary address to Samuel Hartlib, an acquaintance of Pepys, says: ". . . this county is reputed the orchard of England." This writer also relates the royal appreciation of local cider: "When the King (of blessed memory) came to Hereford, in his distress, and such of the *Gentry* of *Worcestershire* as were brought there as *Prisoners*; both *King* and *Nobility*, and *Gentry*, did prefer *Cider* before the best *Wines* those parts afforded."

This prosperity was not destined to last long. Commercial progress was almost an impossibility owing to the lack of transport facilities. "For gardens we have little encouragement to design more than is for the necessary use of our families, except our River Wye may be made navigable for transportation" (*Beale*). Thus the enthusiasm previously shown for good orchard culture gradually weakened, and in the 18th century the orchards were sadly neglected.

This century produced many great orchard authorities, who with their practical works on orchard management sought to change this disastrous state of affairs. Hugh Stafford of Pynes first published his work on "Cider Making" in 1753; Marshall his "Rural Economy" in

CIDER ORCHARDING IN HEREFORDSHIRE

1789; followed by Clarke in 1794. In 1797, Thomas Andrew Knight published his treatise on "The Culture of the Apple and Pear." In this celebrated resident, Herefordshire may claim to have produced the founder of modern horticultural science. Knight raised many new varieties of fruits, and the results of his scientific activities may be seen and read to-day, a lasting monument to one of the world's greatest horticulturists. His last great work, the "Pomona Herefordensis," appeared in 1811. Thomas Andrew Knight died, at the age of 79, in the year 1838.

A century of neglect had elapsed with the closing of the 18th century. John Duncumb, in his "General View of the Agriculture of the County of Hereford" in 1805, states this fact. At that time, however, some attempt at orchard renovation was taking place in spite (or, possibly, as the result) of the stirring events of the period.

The 19th century brought about a change in local orchard practice and culture, for which we are indebted to Knight and Sir E. C. Scudamore Stanhope of Holme Lacy. Culinary and dessert apples and other fruits were more extensively grown than formerly, and from that time onwards have generally received better cultural treatment than vintage fruits. Possibly as a result of their untiring labours, the county, in 1883, with 27,081 acres of orcharding, was credited with growing a greater area of fruit than any county in England. Two years later, the famous "Herefordshire Pomona" was published by Hogg and Bull. This authoritative work was the result of nine years patient labour and study by the Woolhope Naturalists' Field Club in their endeavour "to improve the varieties of fruit grown, and to restore the commercial position of their products." A further quotation from this great work will clearly show the state of neglect and the realization of its effect. "The condition of the orchards generally, at the present time, is most unsatisfactory, and close attention will be required for many years to restore their value. A century of neglect has caused the loss of many of the best varieties of fruit, for the number of vacancies, from the prevalence of cold, wet weather, the ravages of insects, the violence of storms, or the effect of age, that are constantly occurring in the orchards, is very great."

Neglect of the local cider apple culture at the beginning of the present century has emphasized the truth of this statement. The majority of local vintage trees are now

CIDER ORCHARDING IN HERFORDSHIRE

either old or young, and the effect of this lack of foresight becomes increasingly evident as these older trees die out; the demand for cider increases and the source of supply to the factory diminishes. Doubtless, the pre-war price of £1 to £2 per ton obtained for mixed fruit was inadequate to meet the cost of proper treatment for established orchards, or for the planting of new ones.

The consumption of cider since the Great War has, however, steadily increased, and it has been estimated that our annual consumption of this beverage is now approximately between fourteen and twenty million gallons. Particulars of the imports of cider and of raw cider apples into this country are not given in the trade returns of the United Kingdom, as the official classification does not provide for their separate enumeration. The total imports, therefore, of cider and perry, not containing added spirit, into the United Kingdom during 1931, amounted to 370,705 gal., of a declared value of £14,464. In 1932, the quantity increased to 2,353,330 gal., valued at £97,181. In addition to cider and perry, there is also a large annual importation of foreign fresh and dried cider apples and perry pears. According to the official trade returns of France, the exports from that country to the United Kingdom of cider apples and perry pears, including residues of fresh apples and pears, amounted to 32,850 metric tons in 1931 and 29,869 metric tons in 1932. Although the values of these exports are not recorded, this quantity doubtless represents a substantial loss to British growers. The immediate advantages gained by renovating existing orchards, and the financial possibilities of new orchards planted with suitable varieties to ensure adequate supplies for the future, are, therefore, evident.

The serious falling off of supplies, and the increasing demand and present price have, however, greatly influenced local farmers to renovate old orchards and establish new ones. The interests concerned are fully alive to this, and as a result it is estimated that no fewer than 40,000 cider apple trees were planted in Herefordshire during the five winter seasons from 1927-28, and 1931-32 inclusive, but this planting, obviously, cannot affect the position for some years to come. This figure would represent an additional area to the county of approximately 833 acres, or roughly 3 per cent. of the estimated 30,000 acres of cider orcharding sufficient to render the country independent of imported

CIDER ORCHARDING IN HEREFORDSHIRE

produce. Although orchard statistics for this period show, at the most, an increase of only 261 acres, inclusive of all orchard fruits, they cannot fail to indicate the immense amount of orchard renovation that has been done locally in recent years. This comparatively small increase would largely be accounted for by the deplorable condition of the older orchards and the present trend towards general improvement in orchard technique. In addition to natural resources, the guaranteed minimum price of not less than £4 per ton for cider apples for a period of five years will continue to stimulate orchard improvement, and so speed up production. There is, therefore, still plenty of room for the further development of cider orcharding, and with excellent factory facilities and favourable natural conditions, one may expect the industry to increase and prosper.

To encourage this development, the County Council Agricultural Education Committee, in conjunction with the Herefordshire Branch of the Cider Makers' Association, has inaugurated a cider orchard competition open to residents in the county. Prizes to the value of £90, with an additional grant of £10 towards expenses, are provided through the generosity of this Association. The five classes provided in this competition are divided into two separate sections to encourage owners and tenants in caring for established orchards, and the planting of new ones. To what extent this first competition has justified itself, is well illustrated by the judge's remarks. In submitting a very comprehensive report of 37 entries (August, 1933), Messrs. E. T. Cave and A. D. Turner state: "The total area, for all classes, which we walked over and inspected was well over 200 acres, and, with only one or two exceptions, we found the entries worthy of being entered for competition and of a very high standard."

During the past three winters, the Agricultural Education Committee, in conjunction with manufacturers of spraying machinery and tar-oils, arranged a series of demonstrations in winter spraying at 13 centres in the county. The total attendance at these demonstrations has been 625, and there is reason to believe that they led many farmers to spray who had never done so before. In addition to spraying and pruning demonstrations, four Ministry extension lectures were attended by 365 farmers and fruit growers. A noteworthy feature during this period has been the introduction of contract spraying by a number of firms and private

CIDER ORCHARDING IN HEREFORDSHIRE

growers who have been enterprising enough to take this matter up, and excellent work is being done by them. It is estimated that the acreage of orcharding sprayed for the first time with tar-oil amounted to 200 acres during the 1932-33 season, and 600 acres in the winter of 1933-34.

A striking illustration of the results obtained from systematic cultivation locally is shown in some cropping data from 25 varieties, collected by the writer from a six-acre cider orchard near Hereford. The trees were raised at the Research Station, Long Ashton, and were planted during the winter of 1908.* Observations in regard to growth characters, diseases and pests, blossoming and cropping have been collected and tabulated since 1931, and will be continued over a period of years. In 1931, the total crop amounted to 4 tons 11½ cwt. All varieties were pruned during the winter of 1931-32, and the 1932 crop was 2 tons 2 cwt. In summarizing the cropping data during that period, the four varieties Yarlington Mill, Fair Maid of Devon, Sweet Coppin and Dabinet in 1931, produced 57½ cwt. of the total crop of 91½ cwt. from the twenty-five varieties, viz., an average of 14½ cwt. per row of 11 trees each. Compared with these figures the four varieties yielded a quarter crop in 1932, viz., an average of 4 cwt. per row, the total crop from the twenty-five varieties being 42 cwt. Thus the total crop over two years for this 25-year-old six-acre orchard was only 6 tons 13½ cwt.

During March, 1933, the whole orchard, including ten old trees in the corner of the field, were sprayed for the first time with a tar-distillate wash. One hundred gallons of concentrated fluid were used at 7½ per cent. dilution and applied by means of a manual portable spraying machine (ninety gallons were applied with the Council's power machine at 6 per cent. in March, 1934). The resultant crop in 1933, including 44 cwt. from the ten mixed varieties, amounted to 28 tons 2 cwt., which at 95s. per ton, gives a total value of £133 9s. 6d. Doubtless as a result of the pruning and spraying treatment, and encouraged by a favourable season, the orchard produced the heaviest crop since it was planted. The average yield per tree from the 25 varieties since 1931 is as follows:—Yarlington Mill, 7 cwt.; Sweet Coppin, 6 cwt.; Fair Maid of Devon, 5 cwt.; Improved Pound, 4½ cwt.; Court Royal, 4½ cwt.; Sweet Alford, 4½ cwt.;

* See this JOURNAL, Feb., 1928, p. 1010.

CIDER ORCHARDING IN HEREFORDSHIRE

Dabinet, $4\frac{1}{2}$ cwt.; No. 32 Ashton, $3\frac{1}{2}$ cwt.; Kingston Black Improved, 3 cwt.; Killerton Sweet, $2\frac{1}{2}$ cwt.; Kingston Black, $1\frac{1}{2}$ cwt.; Cherry Norman, $1\frac{1}{2}$ cwt.; Broad-Leaved Jersey, $1\frac{1}{2}$ cwt.; Knotted Kernal, $1\frac{1}{2}$ cwt.; Strawberry Norman, 1 cwt.; Cap of Liberty, 1 cwt.; Cowarne Red, $\frac{3}{4}$ cwt.; Skyrmes Kernal, $\frac{1}{2}$ cwt.; Hereford Redstreak, $\frac{1}{2}$ cwt.; Eggleton Styre, $17\frac{3}{4}$ lb.; Old Foxwhelp, $7\frac{1}{2}$ lb.; Dymock Red, $2\frac{1}{2}$ lb. The two varieties planted as Somerset Redstreak ($4\frac{3}{4}$ cwt.) and Butleigh's No. 14 ($\frac{1}{2}$ cwt.) contain some rogues of other varieties and are omitted from the trial. The variety planted as Medaille d'Or has since been re-grafted with culinary varieties. Of the above varieties, Yarlington Mill, Sweet Coppin, Fair Maid of Devon, Dabinet and Sweet Alford have consistently cropped during the three-year period. The following table gives a hypothetical estimate of the yield and value of the crop from an acre planted with these varieties. The estimate is based upon the actual yield derived from eleven trees of each variety:—

	1931.						1932.						1933.					
	Per Acre.						Per Acre.						Per Acre.					
	Weight.		Value.				Weight.		Value.				Weight.		Value.			
	Tons.	Cwt.	£	s.	d.		Cwt.	£	s.	d.		Tons.	Cwt.	£	s.	d.		
Yarlington Mill	3	17½	18	8	1		17½	4	3	1		12	3	57	14	3		
Sweet Coppin	2	16½	13	8	4		20½	4	17	4		10	9	49	12	9		
Fair Maid of Devon	3	4¼	15	5	2		13¼	3	2	11		8	0¾	38	3	6		
Dabinet ...	2	11	12	2	3		20½	4	17	4		6	14	32	3	6		
Sweet Alford...	1	8½	6	14	2		3½	0	15	5		9	0½	42	17	4		
Per Acre ...	2	15	13	1	3		15	3	11	3		9	5	43	18	9		
(48 Trees)							Pruned.						Winter Sprayed.					

The results of systematic cultivation, as estimated by the evidence of these figures, should undoubtedly lead to the planting of suitable varieties and the adoption of similar cultural practices on a still wider scale.

The Agricultural Education Committee now possess a powerful 5-h.p. eight-nozzle spraying outfit, and this may be hired by farmers who wish to spray their cider-apple trees, the charges covering bare cost of wash, labour, fuel and transport. The machine is provided with 1,000 feet of steel main and 1,500 feet of rubber hose and accessories. This substantial gift was presented to the Committee, in January, 1934, by Messrs. H. P. Bulmer & Co., Ltd., Cider Makers, Hereford. The outfit was first used on January 16, 1934, and finished spraying on March 29,

CIDER ORCHARDING IN HEREFORDSHIRE

during which period approximately 208 acres of orcharding were sprayed on 25 farms. These orchards varied a great deal, as some were very young while others were fully matured. Similarly, many orchards that were sprayed contained both very young and very old trees. The strengths of the standard tar-distillates applied were of 6, $7\frac{1}{2}$ and 10 per cent. concentration, according to the age and condition of the orchards, and the date of spraying. Seventy-six standard 40-gallon drums were used, and the concentration of spray fluid throughout the season averaged 6.8 per cent. The spraying gang, provided by the grower, averaged four men per day throughout and were generally unskilled in fruit tree spraying. These men worked under the instructions of the Committee's supervisor, who also attended to the lay-out, records, transport and other working details and to whom much of the success obtained in this new work is due. Costings of spraying and details of labour are given to assist cider-apple growers and contractors in estimating future work under similar orchard conditions. The costs, however, do not include depreciation of plant, interest on capital, transport of machine, fuel, oil, and the extra labour required for operating the spray lances or spray guns. The four latter items were provided by the grower. The extra labour cost would, however, average approximately 5s. 4d. per acre, and fuel and oil, 1s.

Some six years ago, Messrs. H. P. Bulmer & Co., Ltd., inaugurated a scheme for the planting of new cider-apple orchards, or the renovation of old ones, and this work has undoubtedly been of great value to the cider industry of Herefordshire. New orchards have been systematically planted and a considerable amount of orchard renovation has been done, and this will in time increase the value and revenue of many farms and small holdings throughout the county. The cost of planting is relatively low, since each 3- or 4-year-old tree costs only 2s. 6d., and the protectors 1s. 3d. per set, including creosoted stake, wire netting and barbed wire. Further, every assistance is given in marking out, etc., the whole planting being done for 1s. per tree, including transport. Foundation pruning is done for the first three or four years at a reasonable charge if desired, and a report upon the orchard is made by the firm's orchard inspector. In order to assist those who may find themselves unable or unwilling to face the lock-up of capital involved in planting, cider-apple trees may be purchased on deferred

CIDER ORCHARDING IN HEREFORDSHIRE

Spraying of Orchards

<i>Labour.</i>	Total		Per Acre	
	hr.	mins.	mins.	secs.
Waste time (bad weather)	67	00	19	19
Orchard delay	18	45	5	25
Loading and road haulage (including delays)	88	45	25	36
Unproductive time (laying out, uncoupling, etc.)	97	55	28	14
Actual spraying time	247	35	71	26
Orchard working time	520	00	150	00
Cleaning and storage of apparatus ...	8	30	2	24
Good Friday	8	30	2	24
Total time	537	00	154	48

<i>Costs.</i>	£	s.	d.
Labour: 2 men for 514 hours each	42	3	6
Overtime: 2 men for 23 hours each	1	14	6
Travelling and subsistence expenses of 2 men ..	10	16	1
'Phone and postages of supervisor	1	0	6
Gross amount earned	55	14	7
Deduct workmen's contributions under National Health and Unemployment Insurance Acts ..	1	5	8
Nett amount earned	54	8	11
Add County Council and Workmen's contributions under National Health and Unemployment Insurance Acts	2	8	2
Workmen's Compensation (approx.)	1	2	0
Tar-oil supplied by H.C.C., 50 drums at 57s. 6d. ...	143	15	0
Tar-oil supplied by Growers, 26 drums at 57s. 6d.	74	15	0
Nett costs of spraying 208 acres	£276	9	1
" " per acre	1	6	6½
" " " drum	3	12	9
" " " applying drum	15	3	
" " " hour (537)	10	3½	
Average costs per tree (48 per acre) ..			6½

terms. Under this scheme the annual cost of trees for planting one acre (at 40 or 50 trees to the acre) is 23s. 4d. or 29s. 2d., respectively, per annum for five years after the first year, or after the second year if the planting is done by the firm.

Notwithstanding these considerations, there is a doubt whether all farmers will give the young trees adequate attention unaided. Numerous healthy trees have been correctly planted, staked and protected against vermin and stock in pest-ridden and neglected orchards; such conditions not only hinder their growth and general health, but shorten their period of profitable life. Even if it is admitted that the value of the crop may limit spraying costs in some of the

CIDER ORCHARDING IN HEREFORDSHIRE

very old orchards, a modest winter spraying programme is a remunerative undertaking when a crop of 10 tons per acre is obtained. Further, planting and harvesting costs are low, since the ripe fruit is shaken from the trees. Improvements in transport facilities have brought the cider factories of the county within an hour's journey, so that the farmer has no cause to echo Beale's complaint. He may now enjoy the beauties of the Wye en route for the cider mills regardless of its past limitations. Could Beale have but visualized present-day conditions, he would surely remark that these factories now provide an opportunity for the resuscitation of the "Orchard of England."

Although there is still a general air of neglect in the majority of local cider orchards, they are slowly but surely improving. The farmer is beginning to realize that in a cider orchard he has a good investment, and there seems no reason to doubt future prospects.*

* *National Mark Cider*.—During the 1933-34 cider season, the output of National Mark cider was more than double that of the preceding season. National Mark cider, in addition to being of a guaranteed standard of purity, is made exclusively from home-produced cider fruit; and, with the excellent cider-apple crop of 1934, it is confidently anticipated that progress will be maintained during the current season.

MARKETING NOTES

Milk Marketing Schemes.—*Reorganization Commission.*—The decision to appoint a Milk Reorganization Commission for Great Britain was announced by the Secretary of State for Scotland on December 10, in reply to a Parliamentary Question by Captain Shaw, M.P., on the subject of the Scottish Milk Marketing Scheme. The following is an extract from the statement circulated with the Official Report:—

" 5. Having regard to the general situation I came to the conclusion that the review of the position which it was intended to undertake, with a view to securing a permanent settlement, should be of a more comprehensive character than that previously contemplated. I have accordingly been in consultation with my right hon. Friend the Minister of Agriculture and Fisheries, and we are agreed that sufficient experience has now been gained of the working of organized milk marketing in Great Britain to enable an examination to be usefully made, in the course of the next twelve months, of the possibilities of further improvement, including the question of co-ordination or amalgamation of schemes.

" 6. We propose, therefore, to constitute a Milk Reorganization Commission for Great Britain, which would undertake this comprehensive survey."

November Pool Prices.—The wholesale contract price for November under the English Milk Marketing Scheme was 1s. 4d. per gal. in all regions, the price being the same as in October. Pool prices and rates of producer-retailers' contributions fixed by the Board for November are given below, with comparative figures for the previous month.

Region	Pool Price (Pence per gallon)		Producer-Retailers' Contributions (Pence per gallon)	
	Oct.	Nov.	Oct.	Nov.
Northern	13½	14	1½	1½
North-Western		14	2½	1½
Eastern ..		14½	1	1½
East Midland		14	1½	1½
West Midland		13	2½	2½
North Wales		13½	2½	2
South Wales		14	1½	1
Southern		14½	1½	1
Mid-Western		13	2½	2
Far-Western		13	3	2
South-Eastern ..		14½	1½	1½
Unweighted Average	13.55	13.80	2.03	

Producer-retailers who did not sell milk by wholesale during the month otherwise than on contracts carrying level-

MARKETING NOTES

delivery premiums were credited with a level-delivery premium of $\frac{1}{2}d.$ per gal.

The inter-regional compensation levy was fixed at $1d.$ per gal. on all liquid sales, instead of $\frac{3}{4}d.$ per gal. as in the previous month. The proceeds were distributed in full among the regional pools in proportion to the milk sold in each region for manufacturing purposes. As in October, no levy was made for expenses, liabilities or reserves.

The estimated sales under contract for the month were 60,284,234 gal., compared with 63,473,702 gal. in October. Liquid sales in November (44,382,665 gal.) showed a decrease of approximately $2\frac{1}{4}$ million gal. and manufacturing sales (15,901,569 gal.), a decrease of 929,000 gal. compared with October, the latter month, of course, covering an extra day. The proportion sold for manufacture constituted 26.4 per cent. of total sales, compared with 26.5 per cent. in October.

Milk manufactured into cheese by farmhouse cheesemakers fell from 1,199,666 gal. in October to 305,869 gal. in November.

Potato Marketing Scheme.—New riddle regulations made by the Board on December 6 remain in operation until January 12, 1935, subject to any further determination of the Board. These regulations increase, as regards certain varieties, the minimum riddle size of $1\frac{1}{2}$ in. imposed by the scheme. The new sizes are:—

For *King Edward*, *Red King* and *Golden Wonder* produced anywhere in Great Britain: not less than $1\frac{5}{8}$ in. riddle.

For *Majestic* produced in the Isle of Ely, Soke of Peterborough, Lincolnshire, Lancashire, Yorkshire and counties north thereof and Scotland: not less than $1\frac{7}{8}$ in. riddle.

For *Majestic* produced elsewhere in England and Wales: not less than $1\frac{3}{4}$ in. riddle.

For any other variety produced anywhere in Great Britain: not less than $1\frac{3}{4}$ in. riddle.

Pigs and Bacon Marketing Schemes.—*Price of Bacon Pigs for December.*—The price of the "basic" pig (Class 1, Grade C) for December, was 12s. 1d. per score compared with 12s. for November.

Bacon Supply Arrangements for 1935.—As stated in the November, 1934, JOURNAL, the date for lodging contracts

MARKETING NOTES

for the sale of pigs to curers in 1935 was extended by the Pigs Marketing Board, with the concurrence of the Minister of Agriculture and Fisheries, to November 20. Contracts lodged up to that date represent 1,689,000 pigs. This was an increase of nearly 7 per cent. on the previous contract period, when the figure was at the rate of 1,580,700 pigs per annum. Moreover, the steps taken by the Pigs Marketing Board to ensure greater regularity of supplies throughout the year succeeded beyond expectation. The proportions of total supplies contracted for delivery in the first, second and third 4-months' periods respectively were approximately 35, 31 and 34 per cent.

The distribution of contracts between individual curers, however, was less satisfactory, the percentage of supplies to estimated requirements varying widely. Moreover, the number of pigs sold to the Pigs Marketing Board on group contracts and available for distribution among curers short of pigs, showed a considerable reduction on the previous period and was inadequate to meet all needs. Representations were accordingly made by the Pigs and Bacon Marketing Boards to the Minister of Agriculture and Fisheries as to the necessity for a further extension of the time available for securing contracts, in order to permit the Pigs Marketing Board to obtain supplementary contracts for a substantial number of pigs. It was believed by the Boards that many producers had been deterred from contracting by the minimum and maximum seasonal percentage requirements, which were a new feature of the 1935 contract, and that, given time, many more pigs could be obtained, in particular in the last eight months of the year.

In view of the adverse effect that a low throughput has on curers' costs, a further extension of the period up to December 22 was approved, in order to allow the Pigs Marketing Board to obtain supplementary contracts, if possible, for a further 450,000 pigs.

Supplementary Contract.—The form of supplementary contract prescribed by the Pigs Marketing Board, in accordance with the arrangements outlined above, is a contract between a registered pig producer and the Pigs Marketing Board either direct or through an agent, and provides for the sale of stated numbers of pigs, in 1935, to the Board.

The terms of the contract are in most respects the same as those of the main contract. There are, however, no requirements as to the minimum or maximum percentages

MARKETING NOTES

of pigs to be delivered within any given months, and pigs delivered in the months January to April under supplementary contracts will not be eligible for bonus. Curers will contribute to the bonus fund 2d. per score on all pigs received under supplementary contracts, thus increasing the amount of bonus payable to those producers who had already contracted.

Producers were permitted to make supplementary contracts either directly with the Board or through agents, including existing group agents, live-stock dealers or registered curers. Where contracts were made through agents provision was made for the deduction of 1s. per pig from the producer's price, as the agent's commission.

The prices payable by registered curers who obtain from the Pigs Marketing Board pigs sold to the Board on supplementary contracts will be those prescribed in the main contract plus 1s. per pig, i.e., the same prices as are paid by curers for group contract pigs.

Curers in Default on Bacon Returns.—Fines of £5 were recently imposed by the Bacon Marketing Board under paragraph 40 of the Bacon Marketing Scheme, on a number of curers who had failed to make the required returns to the Board of bacon put into cure.

Sugar-Beet: Production of Home-grown Beet Sugar.—Returns furnished by the beet-sugar factories operating in Great Britain show that the total quantity of beet sugar manufactured during November, 1934, and the corresponding month in 1933 was:—

1934	..	..	..	3,221,938 cwt.
1933	..	..	..	2,521,016 ..

The total quantity of sugar produced during each manufacturing campaign to the end of November was:—

1934-5 campaign	..	6,855,865 cwt.
1933-4	..	5,536,735 ..

The condition of the sugar-beet crop continues to be satisfactory; the yield per acre is estimated at between 8½ and 9 tons.

Milk for Schools.—The latest information indicates that the number of children drinking milk at schools was doubled in the first month of the operation of the Government-assisted Scheme. By the end of October approximately two million children were receiving milk daily under the scheme, the quantity of milk supplied during October being roughly two million gallons.

MARKETING NOTES

If regard be had to the initial delay inevitable in some instances in making arrangements for approved supplies, and to the possibilities of increased demands with more general recognition of the benefits of the scheme, a further substantial increase may reasonably be expected in subsequent months.

Milk Act, 1934.—Advances totalling £425,787 have to date been made to the Milk Marketing Board under Section 1 of this Act in respect of milk used for manufacture (excluding milk manufactured by the Board itself or milk used for cheese-making on farms). Provision for advances in respect of milk in the latter categories is made in Sections 2 and 3 of the Act respectively.

Details respecting Section 1 advances are given below:—

Product	Gal. of milk used (April to Sept. inclusive)	Net cost per gal. to purchaser (pence)	Difference between cost and standard price (5d.)	Amount of Advance		
				£	s.	d.
Butter	27,366,683	3½ to 4½	1½ to ½	152,030	1	10
Cheese	41,999,524	3½ to 4½	1½ to ½	237,880	2	11
Milk Powder ...	5,387,395	4½	½	11,223	14	9
Condensed Milk for export	4,402,868	3½ to 4	1½ to 1	24,652	13	6
TOTALS ...	79,156,470	—	—	425,786	13	0

Month in which milk was produced and manufactured	Gal. of milk used	Product	*Rate at which advances were made	Amount of Advance		
1934				£	s.	d.
April	10,949,283	Butter, Cheese, Milk Powder and Condensed Milk for Export	Varying from 1½d. to ½d. according to product and month	65,806	0	9
May	20,064,388			119,390	1	11
June	18,610,304			111,421	6	6
July	10,848,605			54,408	2	1
August	9,880,742			39,508	8	7
September ...	8,803,148			35,252	13	2
TOTALS ...	79,156,470			425,786	13	0

* Difference between the net cost per gal. to the purchaser of the milk or the cheese-milk price (whichever is the greater) and the standard price of 5d. per gal. for the summer months.

Belated claims will slightly increase the figures for the later months.

MARKETING NOTES

Cheese-Milk Price.—For the purpose of Exchequer advances under the first three sections of the Milk Act in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 4.25 pence per pound for the month of December.

The Milk Marketing Board have adopted this price, as determined under the Milk Act, for the purpose of paragraph 2 (1) of the Second Schedule to the prescribed form of contract.

Wheat Act, 1932.—Sales of Home-grown Wheat.—Certificates lodged with the Wheat Commission by registered growers in the period August 1, 1934, to December 7, 1934, covered sales of 15,177,823 cwt. of millable wheat. Sales to the corresponding date (December 8) last year amounted to 12,994,391 cwt.

Deficiency Payments.—The Wheat Commission have made their first advance payment to registered growers in respect of the current cereal year.

The total amount of the advance is £1,669,000 and represents payment at the rate of 3s. per cwt. (13s. 6d. per quarter) to 53,000 growers in respect of 11,127,000 cwt. (2,472,606 quarters) of wheat vouched for by 69,350 wheat certificates delivered to the Commission by the growers concerned during the period from August 1 to November 2, 1934.

The Commission announce that further payments amounting to £15,500 will be made as soon as possible in those instances where, owing to the death or bankruptcy of a registered grower, or for some other reason, the Commission have had to investigate the title of claimants.

The Wheat Commission hope to make three further advance payments in the current cereal year at dates which will be announced in due course.

Definition of Wheat and Offals.—The appeal of the Wheat Commission from the judgment of Mr. Justice Roche in the action against them by Messrs. R. & W. Paul, Ltd., of Ipswich, was begun in the Appeal Court on November 29. The hearing of evidence has been concluded and judgment has been reserved.

Flour Millers' Corporation.—The Corporation are arranging to prepare a provisional draft scheme for discussion with

MARKETING NOTES

the object of submitting it to the Minister for approval in accordance with the Second Schedule of the Wheat Act. The scheme will provide for the election, by registered millers, of members of the Flour Millers' Corporation as well as for the number of members and the functions of the Corporation.

The Cattle Committee.—Up to December 20 payments made under the Cattle Industry (Emergency Provisions) Act amounted to £994,179 in respect of 417,756 animals. The average amount paid per animal was thus £2 7s. 7d. and the average number of animals covered by each payment was 3.2.

Article 59 of the Arrangements approved under Section 2 of the Act empowers the Cattle Committee to approve special arrangements for certification in exceptional circumstances. In pursuance of their powers under this Article, the Committee have made arrangements to enable producers to have their animals certified in restricted areas under the Foot-and-Mouth Disease Orders where the ordinary Certification Centres have been closed. The latter arrangement, which has been made possible by the co-operation of the local Certifying Authorities, has been much appreciated by producers in areas under Foot-and-Mouth Disease Restrictions. The Committee have also recently approved 21 Christmas Markets and Special Shows as Certification Centres for a particular occasion.

National Mark Tomatoes and Cucumbers.—The National Mark scheme for tomatoes and cucumbers will be amended in the following respects for the 1935 season:—

Authorization in the scheme has hitherto been limited to a grower of tomatoes or cucumbers with at least $\frac{1}{4}$ acre (10,890 sq. ft.) of land under glass, but this area has now been reduced to 5,000 sq. ft. A new size range, designated "mixed size," for tomatoes weighing from 1/5 lb. to 1/12 lb. is being introduced in order to cater for local producers who sell their produce in neighbouring towns to retailers who prefer mixed sizes. This additional size range will not interfere in any way with the statutory grades used for wholesale transactions. Further, except by special permission, no tomatoes may be packed under the National Mark in future between November 1 in any year and February 28 on the succeeding year.

In connexion with the cucumber scheme, a new size range, viz., 16 cucumbers to a tray, is being introduced.

National Mark Rhubarb.—A National Mark scheme is already in operation for forced rhubarb, and the natural product, as grown in the field without forcing, is now being brought within the scope of the scheme.

Marketing Norms

One grade only, "Selected," is prescribed by the Agricultural Produce (Grading and Marking) Regulations, 1934.* These Regulations specify the width and length of the stalks (the latter varying with the season), and the colour, condition, etc., of the rhubarb. The scheme also prescribes certain requirements as to the weight of the bunches and the method of tying and packing the graded product.

National Mark Schemes for Fresh Vegetables.—Commercial experience gained in the grading and packing of the vegetables already comprised in the National Mark schemes for fresh vegetables suggests that, apart from minor amendments in some instances, the schemes do not call for any material revision. The National Mark Vegetables Trade Committee reviewed all the schemes on November 20, 1934, and confirmed this view. The amendments agreed on are the introduction of "Selected Large" and "Selected Large (Washed)" grades for celery (each head to be not less than 16 oz. in weight), the deletion of the "Selected Young" grade for green peas, and of the "Standard Glasshouse" grade for cabbage lettuce, and a slight change in the size ranges of brussels sprouts of the "Selected" and "Selected Large" grades.

Details of the schemes, as revised, may be obtained free of charge on application to the Ministry.

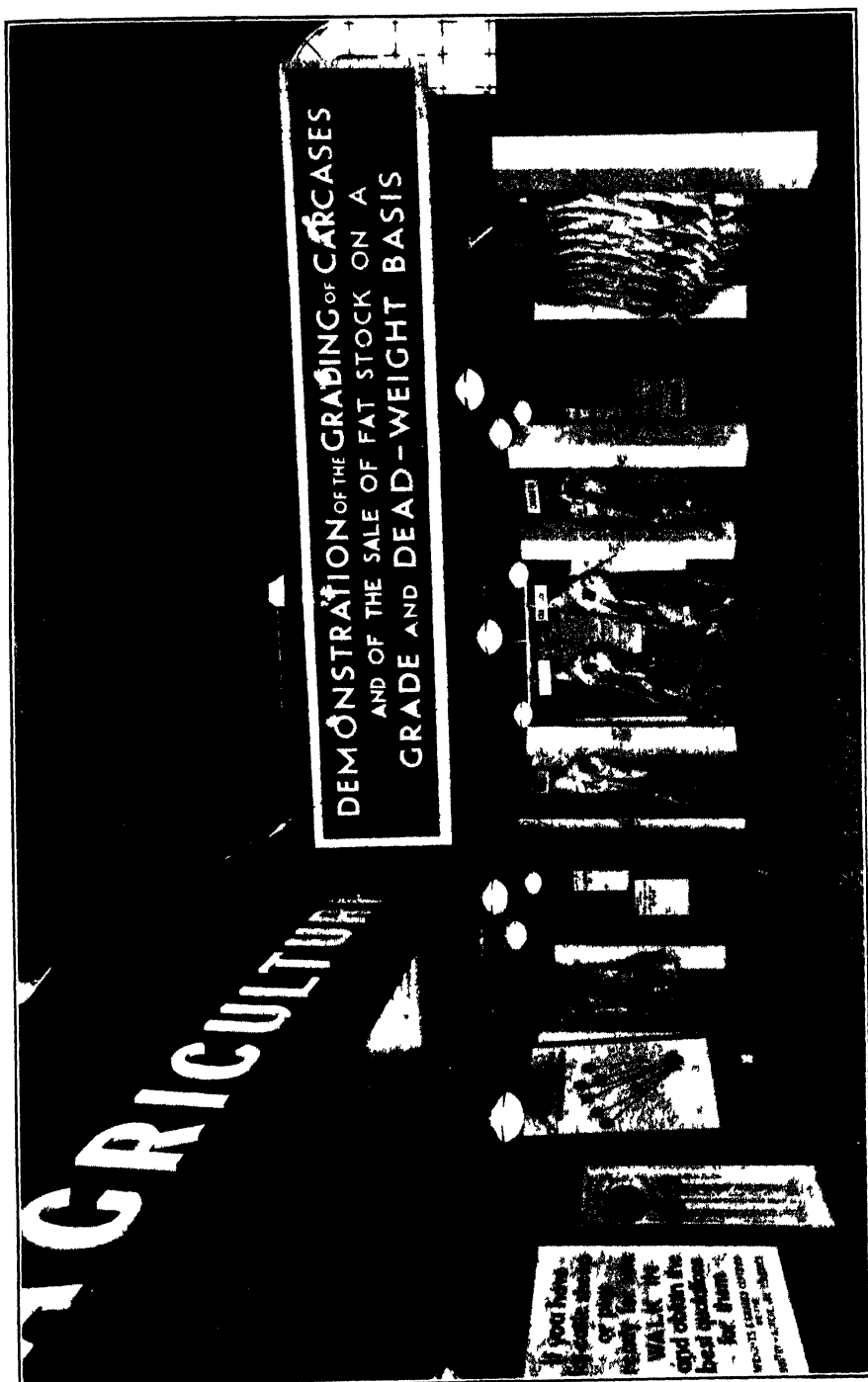
In the August, 1933, issue of the JOURNAL, reference was made to the demonstration of suggested standard grades, packages and methods of packing for the following vegetables:—

Cos lettuce, mustard and cress, endive and Batavian endive, seakale, savoys and red cabbage, Scotch kale, purple sprouting broccoli, spinach, broad beans, marrows, bunched turnips, witloof chicory, globe and Jerusalem artichokes, mint, parsley, sage and thyme.

Apart from a few very minor amendments, the proposed standards have been approved by the Trade Advisory Committee, and National Mark Schemes covering all these vegetables will be introduced early this year.

National Mark Canned Fruit and Vegetables.—Considerable success was achieved in the class for home-grown

* S.R. & O., No. 1353, 1934. Obtainable from H.M. Stationery Office, price 1d.; post free, 1½d.



Demonstration Carcass Display at the Smithfield Club Fat Stock Show 1031

MARKETING NOTES

canned fruit and vegetables by National Mark canners at the Imperial Fruit Show, held at Leicester in November, 71 prizes being secured out of a total of 77 awarded. Of these, 30 were first, 20 second and 21 third prizes.

Fat Stock Shows.—Demonstrations of the grading of carcasses and the sale of fat stock on a grade and dead-weight basis were staged at the Birmingham and the Smithfield Fat Stock Shows. The demonstration at the Smithfield Show was visited by H.R.H. the Prince of Wales, who was greatly interested in the exhibit.

The demonstrations attracted a considerable amount of attention at both Shows. There was a constant flow of visitors to the stands and the officers in attendance were fully occupied answering inquiries. Facilities were available for obtaining actual quotations by telephone from all the grading centres, and many farmers availed themselves of this opportunity to dispose of their stock.

This system of sale was first introduced as an experiment in 1930 in connexion with the grading of beef under the National Mark and was extended, at the request of farmers themselves, to cover all classes of fat stock. The scheme is steadily growing in popularity, and is now in operation at London, Birmingham, Leeds, Bradford, Birkenhead, Liverpool, Manchester and Sheffield. At the Birmingham grading centre, some 3,000 cattle, 10,000 sheep and lambs and 200 pork pigs were dealt with during 1934.

National Mark Campaign in Kent.—In the past, National Mark shopping campaigns have been held in isolated cities and towns. An attempt is to be made in 1935 to organize a campaign as far as possible on a county basis, and the county of Kent has been selected for this purpose. A start will be made in Maidstone on January 24, and this will probably be followed by a campaign in Canterbury during February. A third town has yet to be selected.

All the usual features associated with National Mark shopping campaigns will again be arranged, viz., displays of National Mark produce, shop window display competitions and cinema lectures for housewives and senior schoolchildren. Special cooking demonstrations will be given in Maidstone, and a cookery competition is being arranged in order to attract the housewives of Maidstone as well as those living in the neighbouring rural areas.

MARKETING NOTES

New Zealand: Report of the Dairy Industry Commission.—This Report, which was presented to the Governor-General on October 15, 1934, is a document of outstanding significance. In accordance with its wide terms of reference, the Commission reviews comprehensively the condition of the dairy industry in New Zealand and makes various recommendations for the reorganization of the industry and for the improvement of methods of production, manufacture, sale and distribution. In view of the continuous decline in prices of dairy produce, the provision of financial assistance, at low rates of interest, to dairy farmers is regarded as a matter of urgency. The Commission, however, considers that, if financial assistance on the lines suggested is forthcoming, the industry "can reasonably be expected to respond by accepting the scheme for the reorganization of the administrative side of the industry, and accepting also the measures of self-discipline necessary for the attainment of further improvement in the quality of New Zealand dairy produce."

The Report is divided into five parts. Part I gives a general review of the development and status of the dairy-ing industry in New Zealand and of the course of international trade in dairy produce. Part II deals with problems of export marketing, with special reference to the new marketing regulations enforced by the Dairy Produce Control Board, the possibility of the adoption by the United Kingdom Government of quantitative restrictions or duties on Empire and foreign dairy produce, the development of markets outside the United Kingdom, the seasonality of milk production in New Zealand and the diversification of farming. Part III deals with special problems, including those of rural finance, the improvement of the quality of New Zealand dairy produce, the control of animal diseases, the reduction of costs of collection, processing and distribution, the reorganization of the Dairy Produce Control Board, dairy research, the establishment of a Council of Production and Trade, local marketing and consumption of dairy produce, herd testing, etc. Part IV gives a summary of the main conclusions and recommendations, while Part V contains various appendices and statistical data.

On the subject of quantitative regulation of United Kingdom imports of dairy produce, the views expressed in the Report are of particular importance. After discounting

MARKETING NOTES

as " shadowy and unsubstantial " the possibility of a rise in prices being achieved by other means, the Commission states :—

" We are of the opinion that the possibility of quota restrictions as a means of relief to producers in the Dominions as well as in the United Kingdom should be considered, more especially as, in 1935, the United Kingdom will be in a position to levy Customs Duties on Dominion imports, and, in 1936, will be in a position to deal comprehensively with the matter of quantitative regulation of imports both from the Dominions and from those foreign countries with which trade treaties are now in force. Accordingly, we recommend that, when a convenient opportunity offers, a full discussion of the question with the Government of the United Kingdom should be initiated by the Government of New Zealand." Following this discussion, which would be concerned with such questions as the extent to which it is desired that the British dairy farmer should be assisted, it is suggested that " the Government of the United Kingdom should be requested to arrange a conference of all Empire and foreign exporting countries, with a view to reaching a final settlement." Then follows a significant statement, which sums up the Commission's considered opinion on the whole question :—

" It is desirable that finality should be reached, for there seems to be no immediate prospect of a reopening of the continental European markets from which Northern European production has been diverted to the United Kingdom; and, in the absence of the re-opening of these markets, financial disaster and a more serious reduction of production than any system of quotas would impose appear to be the only possible outcome of the present uneconomic competition in the United Kingdom market. In such an economic struggle, victors and vanquished alike must suffer severe losses, from which the process of recovery will be slow. In our opinion, nothing is to be gained by adopting a policy of inactivity and drift; and much may be lost by its adoption."

As regards the proposed reorganization of the Dairy Produce Control Board, the Commission recommends that a radical change should be made in the composition of the Board, the nominated and representative members in future to be equal in number and the latter to be elected under a new system. More important still, the activities of the re-

MARKETING NOTES

constituted Board are no longer to be limited to export, but are to extend to the internal administration of the whole industry, including marketing for local consumption and to the control of volume and quality of production, processing and manufacture. In many respects, the additional powers and functions which it is proposed to give to the Board are similar to those which have been made available in respect of a Development Board in the United Kingdom under the Agricultural Marketing Act of 1933.

As regards the suggested Council of Production of Trade, it is recommended that this body should act as a permanent, executive Commission of Agriculture, co-ordinating and, where necessary, controlling the activities of the various Produce Boards (e.g., the Dairy, Meat, Poultry, Fruit-export and Honey-export Control Boards) which have hitherto operated as isolated and autonomous units. It is pointed out that co-ordination is necessary not only in matters such as the opening-up of new markets, in which all primary industries have a common interest, but also in matters such as restrictions on exports of meat, in which the interests of two or more primary industries may conflict; it is also essential for the successful operation of schemes of co-ordinated production. It is recommended that the Governor-General in Council should be empowered to transfer to the Council (or Executive Commission) any powers vested in the commodity Boards, subject to the condition that such powers should only be exercised by the Council after consultation with the Board or Boards concerned. It is the intention that, when any powers of a Produce Board have been transferred to the Council, the latter body should decide matters of policy and delegate the execution of its decisions to the appropriate Produce Boards. In other words, the Council would be responsible for strategy and the Boards for tactics in regard to matters of policy and administration.

A Government Bill which is designed to give effect to the main recommendations of the Commission has recently been introduced in the New Zealand Parliament. The principal provisions of this Bill are summarized in the following note.

New Zealand: Agriculture (Emergency Powers) Bill.—In accordance with the recommendations of the Dairy Industry Commission, *Part I* of this Bill provides for the establishment of an Executive Commission of Agricul-

MARKETING NOTES

ture, composed of three full-time salaried members to be appointed by the Governor-General in Council for a period of five years. At least two members of the Commission must have been primary producers, or have been closely associated with the production, manufacture, export or marketing of primary products.

The functions of the Commission will be to co-ordinate the work of the various Boards and other authorities exercising powers in respect of New Zealand primary products; to exercise any powers, now vested in certain existing Control Boards, which may be transferred to it by Order of the Governor-General in Council; to advise the Government with regard to the making of regulations in relation to the production, handling, marketing or export of primary products; to obtain such information as it requires for this latter purpose, and for other purposes; and to exercise any other functions which may, from time to time, be conferred upon it. In the exercise of these functions the Commission is also empowered to act as a statutory Commission of Inquiry. A commodity Board whose powers have been transferred to the Commission by Order in Council may, however, continue to exercise such powers with the authority of the Commission and subject to any conditions which the Commission may approve. The expenses of the Commission, in so far as they are attributable exclusively to the exercise by the Commission of the statutory powers and functions of the various commodity Boards, shall be paid out of the funds of the Boards concerned. Any other expenses of the Commission may be paid out of moneys appropriated by Parliament for the purpose.

Part II provides for the reorganization and reconstitution of the Dairy-produce Export Control Board. The principal changes which are involved may be summarized as follows:—

(1) In addition to the powers of export control, conferred upon it by previous legislation, the Board is authorized, in accordance with regulations, to regulate and control the production of dairy produce in New Zealand, and the handling, grading, marketing, transport and distribution of dairy produce intended for consumption in New Zealand. Dairy produce is re-defined as including butter and cheese, and all other products of milk or cream, whether produced therefrom by manufacturing processes or otherwise. As a consequence of this extension of its powers, the name of the Board becomes the "New Zealand Dairy Board."

(2) The new Board will be composed of seven members, of whom three are to be appointed by the Governor-General in Council, and three are to be elected by owners or occupiers of dairy factories, exclusive of the New Zealand Dairy Company, Limited, which is to appoint its own representative on the Board. For the purposes of the election of the elective members, New Zealand is to be divided into three wards, the votes of any company being calculated on a tonnage basis.

(3) The Board is empowered to make levies on dairy produce manufactured for sale, whether such dairy produce is subject to the control of the Board or not. Differential levies may be prescribed in respect of different kinds of dairy produce and in respect of dairy produce exported from New Zealand or intended for home consumption.

(4) The Board may appoint dairy instructors, and, subject to certain conditions, officers from the Public Service.

MARKETING NOTES

Part III authorizes the expenditure of such sums as may be appropriated by Parliament for the rehabilitation of the dairy industry in all or any of the following respects:—

- (a) the construction, reconstruction, equipment and improvement of dairy factories;
- (b) securing improved conditions in and about dairies;
- (c) the eradication of disease in dairy herds;
- (d) any other purposes for which grants or loans may be found necessary to give effect to the recommendations of the Dairy Industry Commission.

For the year ending March 31, 1935, a sum not exceeding £500,000 is made available for the above-mentioned purposes, without further appropriation.

Part IV authorises the making of regulations, by Order in Council, for the purpose of giving effect to the recommendations of the Dairy Industry Commission and generally for the purpose of securing the effective conduct of the industries with which the Executive Commission of Agriculture is for the time being concerned. In particular, regulations may be issued for any or all of the following purposes:—

- (a) Prescribing the conditions to be observed by persons engaged in the production of milk or cream for sale, and, if considered necessary, for the licensing of such persons and of their premises;
- (b) For the transport of milk or cream to dairy factories;
- (c) For the licensing of dairy factories;
- (d) For the handling and marketing of dairy produce in New Zealand or elsewhere;
- (e) Prescribing the maximum amount of the levies that may be imposed upon dairy produce intended for consumption in New Zealand or export;
- (f) Prescribing the purposes for which the proceeds of such levies shall be applied;
- (g) Any other purposes for which regulations are contemplated by or may be required to give effect to this Act.

All such regulations must be laid before Parliament and shall expire on the last day of the Parliamentary session except in so far as they are expressly validated or confirmed by an Act of Parliament passed during the session.

Union of South Africa—Live Stock and Meat Industries Act, 1934.—The Live Stock and Meat Industries Bill, 1933, which was outlined in this JOURNAL (May, 1933, p. 155), was introduced to replace the Meat Trade Control Act, 1932. Certain provisions of the Bill were amended or deleted and the Act was passed in July, 1934.

The new board of control consists of eleven members, appointed by the Governor-General, comprising a chairman, nominated by the Minister of Agriculture, and representatives of pedigree breeders (1), live-stock farmers (4), exporters (1), butchers (1), auctioneers (1), the larger local authorities (1), and the Chambers of Commerce (1). The Director of Native Agriculture and such other officers of the Department of Agriculture as the Minister may from time to time nominate also sit on the board, but without power to vote. If at any time a

MARKETING NOTES

levy on pigs is instituted, a representative of pig farmers will be added to the board.

Provision is made for the imposition of a levy, up to a defined maximum, on all home-produced cattle and sheep slaughtered. The board has power to pay out of its funds a bounty on exports of beef, mutton, slaughter cattle or slaughter sheep. The funds may also be used to assist the industry generally. Separate funds are to be kept in respect of cattle and of sheep. The provision as to bounties does not apply to re-exports. The power to impose levies on all cattle and sheep slaughtered has already been exercised, and as from August 15, 1934, the following rates became payable:—

Cattle 6 months old and above 2s. per head.

„ under 6 months of age 6d. per head.

Sheep 3d. per head.

A system for the registration of bulls and the sterilization of unregistered bulls may be instituted in any area in which a majority of cattle farmers in the area vote in favour of that course.

The Act provides that the Governor-General may confer on the Board the power to fix a maximum quantity of slaughter stock or meat that may be moved into or from any area, or of slaughter stock that may be offered for sale in the area. Regulations have been issued with regard to the procedure to be followed by buyers and sellers in such instances.

Prices for live stock sold by auction in any proclaimed area must be based upon live weight; and the local authorities concerned must provide scales for this purpose. The Minister may institute an official grading service at prescribed fees. In a proclaimed area all new entrants into the butchering trade must possess the qualifications prescribed by regulation.

Proper records must be kept and returns furnished as prescribed by regulation. Such records are to be available for inspection and must not be destroyed until twelve months after the end of the calendar year to which they relate.

Cold storage plants are to be registered, and where facilities are inadequate stores may be erected out of public funds or with the aid of public loans.

Germany: The Animal and Animal Products Act.—

Since April 1, 1934, the trade in fat animals and animal products in Germany has to an increasing extent been brought under the control of the Minister for Food and Agriculture, on lines similar to the control of the fat and dairy industries.* The object of reorganization is to regulate supplies so that they balance requirements, and to secure the assembly and distribution of animals and their food products at the lowest possible cost.

The policy incorporated in the Animal and Animal Products Act of March 23, 1934, has two aspects—import control and internal control. The importation of live stock and certain live-stock products, including meat, is directly controlled by a Monopoly Department of the Ministry of Food and Agriculture. The Department may prohibit importation except under licence; it may determine the quantities of the regulated products that may be imported, and also the times and places at which they may be distributed by the licensees. Before the regulated products may be released from the points of importation,

* Cf. previous notes in the issues of this JOURNAL for January, 1934 (p. 977), March, 1934 (p. 1179), and June, 1934 (p. 240).

MARKETING NOTES

the importers must pay into the Reich Exchequer such levies as may be prescribed by the Monopoly Department. Control of the imported article is therefore sufficiently strict to ensure that imported supplies will not upset the policy of the Department as regards the home product. In practice, there is no restriction on imported supplies once they have been cleared by the Customs authorities.

The internal arrangements have been devised to abolish speculation in slaughter stock and to ensure that the animals pass through to the centres of consumption by the most direct route, thus avoiding re-pitching. Although the Act covers all animals slaughtered for food, the internal arrangements have hitherto been confined to fat cattle. Control is vested in a Central Market Union with a President, or "Market Commissioner," nominated by the Reich Minister of Food and Agriculture. The Central Union is responsible for formulating general policy and for co-ordinating the work of the Animal and Animal Products Monopoly with the policy of the kindred monopolies for fat and milk. The fourteen districts into which the country has been divided for the purposes of the two latter monopolies form the administrative units of the animal monopoly, each district having a Market Union, the President of which is nominated by the Commissioner for the Central Union. Each District Union is composed of a number of market zones, each of which has a Market Association consisting of buyers and sellers and presided over by a Market Commissioner who is responsible to the Central Union.

The purpose of zoning is to facilitate the regulation of supplies and prices. Within each market zone, farmers, except when selling to other producers, must sell their fat cattle at the approved centres and on conditions approved by the local Market Commissioner. The administrative arrangements may be briefly summarized. Forward sales of fat cattle are prohibited in the regulated areas. Buyers of fat cattle, who pay an annual licence fee, must be registered, and in their application for registration they must state the numbers of cattle handled by them over a specified period. They are called upon to inform the Market Commissioner of their requirements of each class of stock a month in advance. On the basis of these estimates, together with data relating to the sales and destination of stock in the previous week and in the corresponding week of the previous year, the Market Commissioner determines the maximum number of cattle that may be pitched on a market day. The number of permitted offerings is published and sales certificates covering these numbers are issued to producers. The producers on their part are required, before the 15th of each month, to inform the Market Commissioner of the numbers of cattle they propose to offer for sale during the following month, and if this number is greater than the permitted offerings each producer is notified by means of the sales certificates of the numbers he can send to market. In arriving at the permitted quota the Market Commissioner acts in close co-operation with the Central Union. On its instructions, he may prescribe the centres of distribution to which the registered buyers must consign the cattle bought by them at the regulated markets. This, power, however, has only been exercised in exceptional circumstances. There is no provision for compensating either the buyers who might suffer loss through re-selling in the specified market or the producers for any loss they might incur by holding over supplies until a later market day.

Supply regulation is accompanied by price fixation. The object of price fixation is to act as a sort of magnet attracting supplies to one centre or deflecting them from another, and thus correcting any shortcomings of supply control as a means of ensuring stable prices.

The Central Union through its district and local Commissioners prescribes from time to time a price range for each regulated market. The prescribed prices, which take into account transport differentials, are fixed in consultation with a price committee representative of the various interests affected for each market; but this consultation does

MARKETING NOTES

not preclude the Central Union from following an independent price policy. A separate price range, published in advance, is determined for each grade of cattle. Animals must be classed into grades by a panel of buyers and sellers before being offered for sale; bunches of animals consisting of more than one grade cannot be offered for sale as one lot. All transactions must be on a live-weight basis, and it is an offence to sell fat cattle at prices outside the price range specified for the grade in which they are classified.

In order to assist the Central Union in arriving at an equitable price range, a separate sales note covering each transaction must be submitted after each market day, and market owners are called upon to adopt standardized methods in making market reports; for example, the realized prices for a small number of animals (15 per cent. of the total) sold at the top and bottom ends of the price scale are omitted from the official quotations.

It is claimed that the cumulative effect of supply regulation, price fixation and improved market intelligence has been to bring about a large measure of price stabilization in markets, both individually and collectively.

All fat cattle passing through the regulated markets are subject to a special levy, the proceeds of which may be devoted to assisting the live-stock enterprise of peasant producers. There are provisions against a second payment of the levy in respect of animals that have once passed through a regulated market.

At present there are 42 regulated markets, and it is understood that the Minister is about to exercise his powers of extending the number of market zones by order. The inclination of producers to escape regulation by selling outside the regulated zones has been checked by the heavy supplies of cattle available in the country and the lower levels of prices prevailing in the uncontrolled areas.

The Monopoly Department is empowered to fix producers' wholesale and retail prices for all slaughter stock and meat, and may also bring the principal by-products of slaughtering, together with the meat manufacturing industries, within the scope of its general planning.

The Central Market Union, acting in conjunction with local authorities, has already begun to limit distributive margins, and as a result of its general policy it is believed that the returns to the German producer of live stock can be increased without imposing any new burden on the consumer.

COUNCIL OF AGRICULTURE FOR ENGLAND

THE Forty-Third Meeting of the Council of Agriculture for England was held at the Middlesex Guildhall on Dec. 13, *Mr. Clement Smith* (East Suffolk) in the Chair. *The Rt. Hon. Walter E. Elliot, M.C., M.P.*, Minister of Agriculture, *The Earl De La Warr*, Parliamentary Secretary, and *Sir C. J. Howell Thomas, K.C.B., K.C.M.G.*, Permanent Secretary, were present.

Cattle Subsidy.—*Mr. R. G. Patterson, O.B.E.* (Staffs) moved the adoption of the Report from the Standing Committee on the Working of the Cattle Industry (Emergency Provisions) Act (see Appendix I, page 1002). He said that had it not been for this Act the position of the cattle feeder would have been very serious indeed. There had been complaints as to the grading of cattle under the scheme, but these were in practically all instances borderline cases as to which judgment was admittedly difficult. There had been a very large number of animals coming forward this autumn because of the shortage of winter keep. He had nothing but praise for the able manner in which the Cattle Committee had done its work. All his own cattle had been sold on dead-weight and he emphasized the advice of the Ministry that all cattle should be so sold. *Mr. Denton Woodhead* seconded the motion. *Mr. W. R. Smith* said he hoped that the action referred to in the Report was not going to be the final provision in the matter. As he saw it, the present was a temporary measure only. The producer would have to alter the old methods and machinery to avail himself of new schemes. *Mr. A. E. Bryant* (Bucks) said that the finest beef at the Fat Stock Show at Buckingham this week brought no more than 3*d.* or so a lb. to the producer. Something should at least be done to make the butchers pass on some of the advantage of low prices, especially to the agricultural workers. *Mr. R. Anderson* (Northumberland) suggested that more dead meat centres should be set up. The nearest to Northumberland was Leeds. A centre at Newcastle would be very convenient. Cattle could not be produced at present prices except at a loss, and he agreed with the last speaker as regards butcher's prices to the consumer. *Mr. Geo. Dallas*, a member of the Cattle Com-

COUNCIL OF AGRICULTURE FOR ENGLAND

mittee, paid a warm tribute to the staff for the speed and efficiency of the work. He added that there need be no fear on the part of any stock-raiser that he would not get a share of the subsidy if he sold his fat stock before March 31 next. The money would not run out. The difficulty about more dead meat centres was the absence of public inspection in them and the need, therefore, to appoint an official representative. If, however, members of the Council put forward suggestions for new dead weight centres they would be most carefully considered and would, if possible, be acted upon. *Mr. A. Matthews* (Hereford) also congratulated the Standing Committee on the Report, which was then put to the Meeting and adopted.

The Milk Situation.—*Mr. James Hamilton* (Lancs) moved the adoption of the Standing Committee's Report on the Improvement which is being effected in the Supply of and Demand for Milk (see Appendix II, page 1004). In doing so, he called special attention to the successful work of the Milk Marketing Board and to the excellent movement to supply milk to school-children. The greatest possible credit was due to the teachers who took part in the work. Besides the milk supplied under the School Scheme, there was a certain quantity supplied free. The arrangements and accounting for the whole were an additional strain upon teachers, who, however, bore it most cheerfully. It was unfortunate that certain Medical Officers were insisting on pasteurized milk for schools. It had caused consternation amongst many suppliers who had been in the movement of milk-for-schools from the beginning. He then read a resolution from the Royal Lancashire Agricultural Society urging that the use of pasteurized milk should not be made compulsory. It viewed with alarm the attempt to supply only pasteurized milk to school-children because of the doubt present in the highest scientific circles as to the wisdom of using such milk in preference to raw milk. *Mr. F. J. W. Nicholls* (Devon) seconded the motion. He was Chairman of School Managers who had got everything ready for the scheme—bottles, etc.—and were then told that they could not be allowed to go on because they were not able to supply pasteurized milk. *Mr. Charles Roberts* (Cumberland) congratulated the Committee on the Report. The institution of the Milk Marketing Board had been a gigantic achievement. A good deal of criticism was always present where

COUNCIL OF AGRICULTURE FOR ENGLAND

there had been great achievement. He thought one blunder, however, was the enormous fines that had been imposed. As regards pasteurization, one could not cope with those misguided individuals who insisted upon it, so long as one was not sure that the milk supply of the country was all perfectly pure. In his own county, the medical officer saw to it that there was Grade A milk for schools where it could be got and, where not, he satisfied himself by personal inspection that the farms supplying the schools were good and clean and the herds and methods were right. He hoped that the Accredited Scheme could go forward. That scheme and the Government's scheme for disease-free milk were apparently at loggerheads. It would pay his county council to spend, say, one-half of the £4,000 a year which they now used on treatment of tuberculosis, on clearing up the herds. The Ministry of Health insisted upon imposing fines and penalties on farmers who had not cleared them up, but who tried to. Why not impose the fines on those who had not tried? At present the veterinary staffs of county councils were insufficient in numbers and the producer could not give such a guarantee that his milk is clean and good as the medical officer could accept without straining his conscience. *The Rt. Hon. Lord Hastings* (Norfolk) asked as to the rate of restriction of imports of processed milks. *Mr. W. W. Sampson* (Dorset) said that the question of the Accredited Producers' Scheme was one of finance, and a poor rural county would be charged very heavily if the county had to bear the cost. *Mr. W. Lanyon* (Cornwall) said that the price of milk in Cornwall was less than 9d. a gallon. Too many people took something out of it. *Mr. Christopher Turnor* congratulated the Committee on the Report. It was, however, not his experience that wholesale prices had risen since the Milk Board commenced its work. Owing to the increase in retail prices consumption had gone down. He thought that the aim should be to eradicate bovine tuberculosis from dairy herds to the point of preventing it from getting into the milk. As regards the Accredited Producers' Scheme, he was in favour of penalizing the wrongdoer for doing wrong rather than giving him higher prices for doing something he ought to do. *Major R. G. Proby* (Hunts) said that 50 per cent. of the opposition of the county councils to the Accredited Producers' Scheme was due to fear that it would cost the councils money. He did not go all the way with Mr. Turnor

COUNCIL OF AGRICULTURE FOR ENGLAND

as regards the scheme. If in England you want to get a higher standard you will do it by encouragement rather than by punishment. *Mr. H. B. Boden* (Staffs) said he disagreed with *Mr. Roberts* as regards the fines of the Milk Board. In his view they had not been excessive when compared with the extra amounts the offenders had put in their own pockets. *Mr. Turnor's* contention that the consumption of liquid milk had gone down was not borne out by the figures of the Milk Board. The Report was received and adopted.

Unemployment Insurance.—*Mr. George Hewitt* moved the adoption of the Standing Committee's Report on Unemployment Insurance for Agricultural Workers (see Appendix III, page 1007). He said that agricultural labourers were anxious to have the benefits of unemployment insurance like other industries. *Mr. Tom Lovell* seconded the motion. He had been an agricultural labourer now for 72 years. There was a time, he said, when he had called the Agricultural Workers' Union together and found them against such insurance, but times had changed. *Mr. John Beard* asked whether the words "be self-contained and" should not be struck out of the Report. In arguing the case he said that the agricultural worker was well fitted to take any job of manual labour and should therefore regard himself as better off under a general scheme. *Mr. Dallas* said that agriculture had a separate Wages Board apart from the Trade Board Scheme and came under the Ministry of Agriculture. In any scheme of unemployment insurance the peculiarities of the industry had to be borne in mind. He would be prepared to agree that the words "self-contained" could be omitted so long as the following words "special provisions, etc.," were retained. *Major Proby* advised sticking to the original wording. *Mr. A. Pearce* then seconded *Mr. Beard's* amendment. *Mr. Denton Woodhead* said he was not entirely in agreement with the Standing Committee Report, but he would go to the opposite extreme to *Mr. Beard*. The general scheme was in debt to the extent of £105 million. Was agriculture to be brought in to share part of that debt? He thought that the Standing Committee should have gone into the case more closely and given evidence before the Statutory Committee. His own view was that a special scheme for agriculture might be set up outside the Act. *Lord Eltisley* (Cambs) said the important thing was a decision in favour of unem-

COUNCIL OF AGRICULTURE FOR ENGLAND

ployment insurance for the agricultural worker. The Council should reaffirm its previous decision and press for the kind of scheme suggested in the Report. When the scheme was prepared he would advocate some sort of referendum to the agricultural labourer himself and not to the unions to which they belonged. *Mr. Patterson* hoped that the Council would not accept the amendment. What the scheme should provide was that the money which had been paid in by the agricultural industry should be used for agricultural workers. *Lt.-Col. Sir Merrik Burrell, Bart., C.B.E.* (West Sussex) suggested that the Council might consider appointing an *ad hoc* committee to go carefully into the whole question. *The Chairman* then put the amendment of the Report to the Meeting, which was lost. He explained that the Statutory Committee had concluded their evidence so that the appointment of an *ad hoc* committee was not feasible. The Report was then received and adopted.

Minister's Address.—*The Minister* said that the existence of the Council could not be better justified than by the discussions that had taken place this morning. The Reports of the Standing Committee were now occupying more of the time of the Council, as was right and proper. Considering first the Report on Unemployment Insurance, the Statutory Committee were now examining the case for agriculture, and the Council would not wish him to say anything on it as the matter was *sub judice*. It should, however, be possible for the Council, or Standing Committee, to consider the details of any scheme before legislation was passed for its enactment. It had to be remembered that until recently the agricultural labourer had only the Parish to go to, but the Parish had now gone. Regulations had been before Parliament only this week laying down new scales and conditions for relief which were of a general character. The Standing Committee would have to examine them carefully to see how they will affect the countryside.

As regards the Cattle and Beef Position, he thanked the Committee for the terms of the Report as far as the subsidy was concerned, and the Council for the way in which it had accepted the Report. The statement that there was no evidence to bear out the contention that the Act had operated in reducing prices to the farmer below what they would have been had there been no special subsidy on fat

COUNCIL OF AGRICULTURE FOR ENGLAND

cattle for slaughter was of great value, and in itself justified the time and trouble the Committee had spent on the subject. He agreed cordially with Mr. Dallas in his tribute to the work of the Civil Servants. Others had helped in the success of the scheme, e.g., auctioneers, farmers and butchers, and thanks were due also to them.

As regards the Milk Report, the Minister said that the reply to Lord Hastings's question was that the cut in processed milks from foreign countries for the last quarter of 1934 as compared with the similar period in 1933 was 30 per cent. for condensed whole milk and condensed skim milk and 25 per cent. for milk powder.

Speaking then in general, the Minister said that it was becoming clear that Agriculture was not merely an agricultural question. Problems were before us to-day that vitally affected the life and health of our great populations, the export and import trade of our crowded towns. Agriculturists had to be brought into the partnership of the nation. It held more hope, perhaps, than any other industry, for many people who could not go back to their old jobs were out of work and were turning to the land. The Commissioners for the distressed areas were stressing the importance of agriculture as a means of relief. In this country, as in other countries, we had to consider the change over from the expanding populations of the nineteenth century to the stationary ones of the twentieth. The populations of western countries had increased by 29 millions from 1921 to 1931. Experts expected that they would not go up by more than 7 millions in the present decade. We had the apparatus of the nineteenth century built up on expanding populations now with us, and we had to think very deeply of the changes that had to be made to meet the new era that was upon us. In the first place, consumption would have to expand. There had been a 7 per cent. increase in the period between 1909 and 1924-27 and a 10 per cent. increase between 1924-27 and 1932, so that the rate was accelerating. Between 1924-27 and 1932 the consumption of bread remained stationary and the consumption of flour actually went down. Butter went up by 40 per cent., milk and dairy produce by 27 per cent., eggs 33 per cent., and fruit went up by 13 lb. per head. If these rates had not gone up there would have been 105,000 tons more mutton and lamb added to the glut, 193,000 tons of bacon, 147,000 tons of butter, 176,000 tons of fruit, 1,700 million eggs, and

COUNCIL OF AGRICULTURE FOR ENGLAND

106,000 gallons of milk in addition to requirements at the previous rates. The consumption of beef had gone down, mutton and lamb up, and bacon and butter up. It had to be remembered that the world's desire to send beef here had not also gone down. This showed how necessary it was to make our survey from the widest possible angle. At present the consuming power of the million people represented by agriculture had been fairly maintained. The rise in agricultural wages had been considerable and was a long way above what it would be had it been based on the rise in prices of agricultural products over pre-War prices. In thirty counties wages had been revised upwards or hours downwards in the last twelve months, or would be before the end of the year. It showed that improved conditions meant not merely an increase of profits for the "boss" but more in the industry. That point was important when it came to discussing matters with the towns, for then the people in the country are sure to be able to purchase more of the produce of the towns. The effect of organization in agriculture was not to drive up prices. We could say of the Marketing Boards that they were desirous of improving consumption and so justify themselves to their own producers. There had to be a remunerative price level, otherwise the machine would not run at all, and the consumer must get the stuff as quickly and as cheaply as could possibly be managed.

Turning to the Milk Scheme, the Minister said he was glad to note the keenness of the discussion on the Milk Scheme. There were difficulties, however, both in England and Scotland. The Secretary of State for Scotland and he had decided to set up a Reorganization Commission for the whole Island to examine methods of improving the working of the schemes on the experience so far gained and also the possibility of further co-ordination.

As regards the Bacon Scheme, the output in 1930 in this country was 1,750,000 cwt., and in 1934 it was 2,400,000 cwt.—a very definite expansion paralleled by few other industries. The pig population had increased by nearly 30 per cent., and it was estimated that for 1935 1,689,000 pigs had been contracted for and contracts up to another 450,000 were now being canvassed. He was not going into the question of prices to-day. They were lower now than in 1930, and it was not said in that year that bacon was being made a luxury article only to be placed on the tables of the

COUNCIL OF AGRICULTURE FOR ENGLAND

rich. If we were to succeed in developing agriculture to-day we must expect initial difficulties, and agriculturists must put a stiff upper lip towards their own difficulties, realizing that the consumer finally had the last word on all questions. Our main effort was to put good and cheap goods before him so that he knew and felt that he was getting a square deal. We were at the beginning and not at the end of very great changes. We were at the beginning of an era in which agriculture would play a larger part in economics, and in our general trade and philosophy of life. The Council could discuss these matters without any intervening of political considerations. Long might it continue, and, for his part, he would do his utmost to maintain the excellent relations that existed between the industry and his Department.

The Chairman in thanking the Minister said how much the Council appreciated his presence at its Meetings.

Meat Imports.—*Sir A. G. Hazlerigg, Bart.* (Leicester) moved the following resolution on behalf of the Standing Committee:—

“ That the Council views with very great alarm the enormous increase in—

- (1) the imports of chilled and frozen beef from the Dominions;
- (2) the tinned and canned beef (including extracts and essences) from foreign countries.

It understands that the Government has the situation under careful review in conformity with the policy outlined in the White Paper issued in July last, but in the meantime, and pending the decision of the Government as to a long-term policy of either drastic reduction of imports, or a levy on imports with a preference for the Dominions, or a combination of both, the Council wishes to state that this enormous increase in imports from both the Dominions and foreign countries is having a very serious effect on internal prices for cattle and beef in this country at the present time, and the delay in an announcement of further policy is destroying confidence in the future.”

Sir Arthur gave figures comparing quantities imported in ten months of the present year with ten months in 1932. He spoke of the importance of the live-stock industry to farming and said it was to-day by far the worst-off part of the industry. He reviewed the happenings of the last two years since Ottawa, and said that the home producer had never been given a real chance in his own home market so far as cattle were concerned. The cattle subsidy of £3 million came just in time. As it was, prices were getting so low that those who feed cattle were being ruined and put out of business, or were trying to come on to the already overloaded milk market. The long-term policy of the

COUNCIL OF AGRICULTURE FOR ENGLAND

Government was anxiously awaited. If the Dominions and the Argentine did not agree to a levy, he would suggest that the Minister should immediately act on the powers given under the Ottawa Agreement and cut down the supplies of chilled and frozen beef from the Dominions, when he would be in a position to impose a further cut on foreign beef; the imports of canned beef could be cut down to the 1932 figure. A guaranteed price, he said, should be given to the home producer. He suggested that the Cattle Committee, with two people elected from the producers, could organize any new marketing scheme for meat. *Sir Merrik Burrell* seconded the motion. *The Minister* said that he would like to examine the position a little more closely in regard to one or two points. It was true that there had been expansion in the imports, under the Ottawa Agreement, of chilled and frozen beef, but if one took imports from the Dominions as a whole and included the Irish Free State the picture presented would be rather different. Comparing this year with last, there was in the first ten months an increase of 600,000 cwt. of Dominion chilled and frozen beef, but there was a reduction from the Irish Free State of 86,000 fat beasts, which represented 500,000 cwt. of beef, in the same period. The net increase for the Dominions was therefore 100,000 cwt. and not 600,000. The imports of chilled and frozen beef from foreign countries showed a reduction of a quarter of a million, so that taking all beef there had been a net decrease of 150,000 cwt. The Minister pointed out that the price to the farmer, including the subsidy, was 3s. to 4s. higher this year than in 1933. It would be well if a long-term policy could be agreed, but it must be remembered that it took a great deal of discussion in and out of Parliament before the industrial policy of this country had been settled fifty years ago, and it was necessary to go warily as a false step might bring ruin. Parliament had shown a keen desire to help the industry, and the White Paper of the Government made a declaration of the lines on which a long-term policy was being sought. He realized the importance and urgency of the problem. He could only say that a short-term policy, which included the subsidy, had prevented a deterioration in the situation. The producers overseas were as much in favour of a settlement of the long-term policy as producers in this country, as they found themselves in the gravest difficulties through the fact that

COUNCIL OF AGRICULTURE FOR ENGLAND

the Empire as a whole had not made up its mind with regard to the needs of the beef situation. *Mr. Roberts* said he could not agree with the language of the resolution because the volume of cattle and beef imports published by the Imperial Economic Committee made it clear that there had not been an enormous increase. There had been improvements in methods of refrigeration which made it possible to keep beef chilled for ten weeks instead of five. The significant figure was that which the Minister had given as to the fall in the beef consumption of this country. There had been a change of taste and fashion coupled with a lack of purchasing power in some quarters. These were the real problems. The live-stock producer was up against the same problem as the milk producer; he had a surplus and prices would not rise until either supplies were restricted or consumption increased. If schemes were planned on the basis of a levy there would be great danger of producing a reaction and bringing the whole structure down. He did know that reducing the price of milk slightly had sent consumption up four- or five-fold. *Mr. Patterson* said that the long-term policy of the Government was anxiously awaited. The resolution was then put to the Meeting, and carried.

Restriction of Flour Imports.—*Mr. W. Hearle* (Cornwall) moved the following resolution:—

"That in the interests of agriculture and of the milling industry, there should be a further restriction on the imports of wheat flour, so as to bring in the wheat *in grain*, and thereby get all the offals which are so much needed."

It was seconded by *Mr. R. P. Allsebrook* (Leicester) and spoken to by *Mr. Beard*. The resolution was carried.

Potato Root Eel Worm.—*Mr. W. Gilding* (Holland) moved the following resolution:—

"That this Council views with alarm the continued spread of Potato Root Eel Worm (*Heterodera Schachtii*) and recommends to the Ministry of Agriculture and Fisheries that more extensive and intensive research should be carried out."

He said that the disease was a very serious one and that growers were grateful to the Ministry for the research which was being carried out. He would like to see additional measures taken. *Mr. Cecil Robinson* (Holland) seconded the resolution, which was put to the Meeting and carried.

Protection for Barley Growers.—*Mr. W. W. Sampson* moved the following resolution:—

"That this Council requests the Government to introduce such measures as are necessary to secure to the barley grower a market which will at least cover the cost of production."

COUNCIL OF AGRICULTURE FOR ENGLAND

He said that at the present time there was no sale whatever for good second-grade barley. He traced the reasons for this, which included a fall in the consumption of beer. He thought that the remedy would be a plan on the lines of the Wheat Act coupled with assistance to the brewers by giving them a tax concession on the higher gravity beer that would not touch the working man's pocket or his beer. *Major Proby* seconded the resolution. *Mr. T. P. Gilbert* (Kesteven) asked what had become of the gentleman's agreement between the brewers and farmers. Any agreement should be put down in black and white next time.

The resolution was put to the Meeting and carried.

Poultry Industry.—*Mr. W. Lanyon* moved the following resolution:—

"That in view of the critical condition of the poultry industry and the necessity for immediate action being taken, the Ministry of Agriculture be asked to put the industry on a sound commercial basis."

Mr. H. W. Thomas (Hants) seconded, and the resolution was put to the Meeting and carried.

APPENDIX I

BEING A REPORT FROM THE STANDING COMMITTEE OF THE COUNCIL OF AGRICULTURE FOR ENGLAND ON THE WORKING OF THE CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACT, 1934

1. The Standing Committee, having collected certain particulars with regard to the working of the Cattle Industry (Emergency Provisions) Act, 1934, and having considered some of the problems connected with the subject, has prepared the following report for the information of the Council.

2. The Act received the Royal Assent on July 31, 1934, and followed quickly on the heels of the Government's White Paper on the Livestock Situation (Cmd. 4651), which summarized the position of the Live Stock Industry in this country and the conditions governing importations and their bearing on the proposed plan of a levy on imported meat including live stock, from the proceeds of which payments would be made to supplement the returns of home producers from the sale of stock in the open market. The White Paper stated the view of the Government that time was necessary to examine the levy plan and its alternatives with the representatives of the Governments concerned, and that, in the meantime, an emergency measure would be put forward to authorize assistance to the industry to an amount not exceeding £3,000,000 in the first instance up to March 31 next. The Cattle Committee was straightway appointed and immediately got to work. By the end of August, arrangements had been made for the scheme of payments in respect of all fat stock sold for slaughter being brought into operation on September 1—the earliest date possible under the Act. By the night of August 31, 1934, over 600 applications for approval of markets as live-weight certification centres had been considered and approved. This number

COUNCIL OF AGRICULTURE FOR ENGLAND

included all these centres where markets were likely to be held on Saturday, September 1, and Monday, September 3. The members of the Certifying Authority (one representative each of producers, butchers and auctioneers) for each of these centres were at once appointed and received instructions as to their duties. In addition to the live-weight centres, 25 dead-weight certification centres had been approved in time to commence operations on September 1. By the end of the following week, the numbers had been increased to 795 live-weight centres and 29 dead-weight centres. The figures under the scheme now stand as follows:—

	<i>Live-Weight Centres.</i>	<i>Dead-Weight Centres.</i>
England	535	20
Wales	100	3
Scotland	120	9
Northern Ireland	72	—
	827	32

Excluded from the above totals are about a dozen Christmas Fat-stock Shows which have been specially approved as centres during the period in which they are running.

3. Up to this day, November 30, 101,260 "A" certificates, 32,969 "B" certificates, and 1,686 "C" certificates have, we are informed, been received for payment in respect of cattle sold under the subsidy scheme, and 102,051 Payable Orders have been issued to the total value of £785,564 in respect of 331,587 animals, the average amount paid per animal being £2 7s. 4½d., and the average number of animals covered by each payment being 3.25.

4. The arrangements for making the payments are reported to be working smoothly, and, as a rule, a payment is made within three or four days of the receipt of the certificate. The estimated cost of administration is reckoned to be 19 per cent. of the estimated payments to March 31, 1935. This figure includes the whole of the capital expenditure involved in starting the Committee.

5. As regards the course of prices of fat cattle, it is well known that there is always, in a normal year, a steady fall in wholesale prices of fat cattle and meat from the middle of July to early November. On the average of the five years, 1929 to 1933, the price of second quality fat cattle had dropped from 43s. in mid-July to 38s. 7d. in mid-October, a difference of 4s. 5d. This year, the average price of 2nd quality cattle at mid-July stood at 34s. 10d. per live cwt. From that point it rose to 36s. 3d. in the middle of August, where it remained until September 5, and thereafter dropped gradually to 32s. 8d. for the week ended October 17. The position, therefore, is that while, over the years 1929 to 1933, there was an average annual fall of 4s. 5d. per live cwt. between the dates mentioned, this year there has been a net fall over the same period of 2s. 2d. per live cwt. Comparing 1934 with 1933, however, the mid-July figure each year stood at 34s. 10d. per live cwt. for second quality cattle, whilst the mid-October price this year stood at 32s. 8d. as compared with 32s. 11d. in 1933. The net fall this year, therefore, is slightly greater than that of last year. The price on November 28, the latest date available before issuing this Report, is 31s. 8d., as compared with 33s. 2d. at the corresponding date last year. There is no evidence in these figures that bears out the contention, made in one or two quarters, that the Act has operated in reducing prices to the farmer below what they would have been had there been no special subsidy on fat cattle for slaughter.

6. With regard to the standard of 52 per cent. fixed as the minimum "killing out" figure at which fat cattle would be accepted under the scheme, it appears that some criticism has been levelled against it on the ground that it allows animals to

COUNCIL OF AGRICULTURE FOR ENGLAND

pass for subsidy which are not really fit for slaughter. The Standing Committee consider that mistakes may have been made in individual cases in sending forward cattle below the 52 per cent. limit, but it does not think that the figure of 52 per cent. was too low having regard to all the circumstances attending this year's live-stock production. Admittedly, it would be considered on the low side for most parts of the country in a normal year, but it must be remembered that a figure had to be fixed which would give graziers in all parts an opportunity of benefiting from the subsidy. The standard of fatness at which beasts are sold for slaughter varies considerably in different districts over the country, and the authorities would not have been justified in fixing a standard which would almost entirely exclude some districts from participation in the scheme. Another reason in favour of a low figure for 1934 was the special character of the season. Being both very dry and hot, the lack of pasture did not permit of grazing cattle growing on to heavy weight and prime condition. As is well known, the standard of beasts for the butcher this year has not in many instances and districts been so high as in a normal year.

7. Where complaints have been received by the Cattle Committee to the effect that the Certifying Authority were passing cattle below standard, we understand that the Committee has taken the matter up in each instance with the Certifying Authority and that in most of these it has been found that the animal was a border-line case as to which judgment was admittedly difficult. The Committee understands that this problem has, within the last month or so, been very carefully considered by the Cattle Committee, and that its inspecting staff has been strengthened so that a considerable measure of uniformity is now being obtained in the decisions of the Certifying Authorities set up under the Act.

8. The Standing Committee considers that this brief record gives a broad view of an extremely able and useful piece of work. It was no easy task for the Committee to frame the regulations in the first instance for an entirely new scheme dealing with the whole beef-producing industry of the country. The soundness of its scheme has been shown by the comparatively easy way in which it has worked, without hitch or serious abuse. The Council will probably wish to record its appreciation of the success of the scheme apart from their welcome of the subsidy itself which, although small, has been of very real benefit to the live-stock industry and has kept many graziers in business who would otherwise be down and out. Many are still in grave difficulty. The Committee does not feel called upon to speculate as to what the position may be at the end of March next, but it feels confident that, if the Government is able to proceed with success along the lines mapped out in the White Paper above mentioned, the industry will revive and flourish.

November 30, 1934.

APPENDIX II

BEING A REPORT FROM THE STANDING COMMITTEE OF THE COUNCIL OF AGRICULTURE FOR ENGLAND ON THE IMPROVEMENT WHICH IS BEING EFFECTED IN THE SUPPLY OF, AND DEMAND FOR, MILK

1. The Committee has had under consideration various questions relating to the milk supply; and, in the first place, it would wish to congratulate the Milk Marketing Board on the measure of success which has up to the present attended its efforts in organizing the milk supply of the country. In doing so—under the scheme approved by Parliament in accordance with the provisions of the Agricultural

COUNCIL OF AGRICULTURE FOR ENGLAND

Marketing Acts—the Board has become the buyer and seller of practically all the milk produced in the country, and the Committee understands that the quantities which passed through its hands from October, 1933, to September, 1934, reached the very large total of 838 million gallons, of which 713 million gallons were sold wholesale under contract, the bulk of the remainder being dealt with by producer-retailers licensed by the Board. Excluding the sales of producer-retailers and farmhouse cheese-makers, the value of the milk sold by the Board under the scheme in the period reached the total of about £33 million. The Committee learns that there will probably be a considerable increase in the volume of milk to be handled during the current contract period.

This tremendous change-over from an original position, where each producer was an independent competitive unit without effective bargaining power, to a position in which a producers' elected board governs the industry under an approved scheme, could not possibly be made without putting some strain on individual members of the industry. When it is remembered, however, that, without the Board, the milk industry must necessarily have entered into a period of very severe depression through over-production and consequent price undercutting, and an inability to make favourable contracts for the sale of fresh milk for household consumption, the value of the Board to the industry will be much better appreciated. As things stand at present, the Board makes prompt payment for liquid milk to all producers; the average price per gallon is higher than it was in pre-scheme days; and the security of the producer is immeasurably greater inasmuch as no milk is ever left unsold.

2. The part which the Government and Parliament have played in bringing better conditions to the industry is considerable. It did not end with the passing of the Agricultural Marketing Acts and the approval of the scheme which set up the Milk Marketing Board for England and Wales and other Milk Marketing Boards in Scotland, for, as soon as the majority of these Boards became well established, the Milk Act of this year was passed. This measure has three objectives:—

- (i) the safeguarding of the industry against the effects of an excessively low level of prices for manufactured milk resulting from heavy imports of dairy products;
- (ii) the improvement of the quality of the milk supply; and
- (iii) an increase in the demand for liquid milk.

3. These matters are dealt with under the Act as follows:—

- (i) by way of conditional advances from the Exchequer in order to bring the returns to Milk Marketing Boards for milk sold for manufacturing purposes up to a standard which is fixed by the Act at 5d. per gallon for the summer months and 6d. a gallon for the winter months;
- (ii) by grants up to a total of £750,000, spread over four years, to help in eradicating disease, particularly bovine tuberculosis, from dairy herds; and
- (iii) by grants to the Marketing Boards of one-half of the expenditure incurred in connection with approved measures for increasing the demand for milk, the total provision for this purpose being £500,000 for each of two years.

4. As regards (i), the advances to the Milk Marketing Board for England and Wales in respect of milk sold in the months of April-September, inclusive, have reached a total of £425,786; these advances are to cover the deficiency between the price of manufacturing milk and the standard price fixed in the Act. As regards (ii), a scheme for helping to eradicate bovine tuberculosis is now in the final stages of agreement between the Departments of State and the industry, known as the Attested Herds Scheme, and it is hoped that this will come into operation at an early date. Under it, owners of Attested Herds will receive 1d. per gallon extra for their milk, which payment will be in addition to any extra price they may be entitled to receive under the Registered Producers' Scheme if and when that comes

COUNCIL OF AGRICULTURE FOR ENGLAND

into force (see para. 6 below). As regards (iii), a wide development of a scheme inaugurated by the National Milk Publicity Council has been approved and came into operation on October 1, 1934. Under this scheme, at the present time, the scholars of about 18,000 schools in the country receive $\frac{1}{2}$ pint of milk per day at the price of $\frac{1}{2}$ d., i.e., at half the ordinary retail price. Complaints have been made in some districts that the Medical Officers of Health have been prepared to approve only pasteurised milk, which has meant in some cases that the already excellent milk supplied by local producers has had to be given up and the agreements between those producers and the schools cancelled. We regard such disturbances as most unfortunate, not only as involving injustice to individuals, but as discouraging the production of clean, raw milk, a policy which in our view demands the fullest support. We would respectfully suggest that this question is one of very great importance, and that the principle involved should receive careful and early attention from the Departments and Authorities concerned.

5. On the subject of raising the standard of the milk supply, all parties agree as to the desirability of steps being taken to secure improvement, but there is a difference as to methods recommended. The Standing Committee's view, as expressed in previous Reports to the Council on the general subject of milk, and, it believes, the view also of the Council as a whole, is that still greater cleanliness in milk is an essential desideratum, notwithstanding the fact that the bulk of our milk supply has much improved in recent years. There is still much which is undoubtedly below standard. The presence of this poor quality milk on the market diminishes the quality of the better milk, if and when it comes to be mixed with it, and may to some extent discredit milk in the eyes of the general public. Because of its presence, also, pasteurization, with its doubtful benefit so far as quality of treated milk is concerned, has been helped to so great a vogue as it has to-day. The Committee considers that the minority of producers whose milk is not up to standard do not sufficiently realize the fact that it is cleanliness in *methods* of milking that counts most, not fine buildings or up-to-date cowsheds; and that it is by no means an expensive business to produce clean milk, as the demonstration of the Milk Marketing Board at the Royal Show at Ipswich this year amply showed—a few clean cloths and currycombs, facilities for washing and drying the hands (no wet milking), half-covered pails and an efficient sterilizing plant to steam-clean the utensils, and milk of low bacterial count is practically assured.

6. For the reason, therefore, that the production of cleaner milk is so simple and desirable, the Committee thinks that it is of urgent importance that a scheme should be put into operation which will have the effect of quickly grading up the backward producers to the level of the main body, and that the public should be made aware of the fact that such a scheme is being operated. The Committee does not presume to judge between the alternative schemes that have been put forward. It is the duty of the Milk Marketing Board to decide on behalf of its producers what is best to be done under the Milk Scheme, Section 63 of which lays it down that a Register of Accredited Producers shall be prepared by them as soon as practicable. On the question of principle, the business of control of milk production and marketing is the Board's by virtue of measures which have been approved by the Council, and the nature of the Accredited Producers' Scheme it shall operate to secure greater uniformity in milk production is a part of that business, and is therefore for the Board's decision alone. It is to be hoped that the Government Departments and the Local Authorities will give the Board all the help they need in a difficult task, the accomplishment of which is agreed to be so much in the public interest.

7. There is another means by which the demand for milk can be stimulated, but that is at present rather in the hands of retailers than in those of producers. It is through the scheme for setting up

COUNCIL OF AGRICULTURE FOR ENGLAND

standards for the sale of cream recommended by the Standing Committee in its Report to the Council dated May 4, 1933. It will probably be sufficient to remind the Council that cream is not used in this country to anything like the extent that it is in many others; that it should be easily possible for the housewife to obtain a 12 per cent. breakfast or coffee cream at a price of about 9d. a pint. The Committee recommended, and the Council agreed in a recommendation, that three standards seemed reasonable; first, a 12 per cent. cream standard for breakfast or coffee cream; a 25 per cent. standard for fruit cream, and a 50 per cent. standard for thick or whipping cream. The Committee feels confident that, if cream at these standards were placed upon the market with a guarantee as to strength under the National Mark regulations of the Ministry, and/or otherwise, at proper proportionate prices compared with the price of fresh milk, a great boon would be conferred upon all classes of households in the country and that the demand for milk would be substantially increased. The situation as regards the sale of cream in ice-cream should also be dealt with, and here again it is suggested that the public should be protected as far as possible by the enforcement of legal standards for the amount and quality of actual cream in all ice-cream sold under National Mark standards, which should be laid down.

8. It is clear from the statement of measures made in paragraphs 2, 3, and 4, above, that the Government is determined that milk production of the right sort shall be encouraged in this country, and that the commodity, being made as clean and safe as it is possible to make it, shall be put in a position to take its proper place in the dietary of the nation. The industry, however, cannot be firmly established on a broad basis if imports of milk products and processed milks are freely admitted, because it looks to the manufacture of cheese, butter, condensed milk, etc., to use up the milk which is surplus to liquid requirements. The Committee is glad to observe that the Government is fully alive to the need for safeguarding the industry, now in course of reorganization, in this respect, and has already secured very substantial reductions of the imports from the main foreign supplying countries, so far as processed milks (condensed milk, both whole and skimmed, milk powder and cream) are concerned.

November 30, 1934.

APPENDIX III

BEING A REPORT FROM THE STANDING COMMITTEE OF THE COUNCIL OF AGRICULTURE FOR ENGLAND ON THE QUESTION OF UNEMPLOYMENT INSURANCE FOR AGRICULTURAL WORKERS

The Standing Committee has reported to the Council on one or two occasions, in previous years, in favour of agricultural workers being brought into benefit under the statutory unemployment insurance provisions. It is of interest in this connexion that, in recent months, the Unemployment Insurance Statutory Committee has taken evidence on the subject with a view to the preparation of a scheme to deal with it. The opportunity is therefore present for the Council to reaffirm the view it formerly expressed, namely, that a scheme of unemployment insurance for agricultural workers is eminently desirable, and to add that, in its opinion, the scheme should be self-contained and have special provisions which would meet the peculiar case of Agriculture. The Standing Committee hopes that the Council, or at any rate the Standing Committee on its behalf, will have an opportunity of considering the details of any proposed scheme before it is brought into operation.

November 30, 1934.

JANUARY ON THE FARM

H. G. ROBINSON, M.Sc.,
Midland Agricultural College, Sutton Bonington.

At the time of writing there is every indication that the shortage of water that has persisted since the summer is in many districts being made good by the December rainfall. The position in regard to spring water can hardly ever have been so acute at this season, especially so far as the Eastern Midlands are concerned. Thus, on the Midland College Farm one spring that has maintained a flow right through the past summer practically ceased to flow in the beginning of December, and the subsequent rains have not yet had time to improve matters. The water deficiency in the sub-soil will not be made good until there have been considerable falls of rain, and unfortunately rainfall of this nature will do much to interfere with normal farming operations.

It may be urged that the dry autumn has provided ample opportunities for pushing ahead with seasonal work, and that good conditions have obtained for the carting off of root crops, the application of farmyard manure and the ploughing of ground for spring-sown crops. This is essentially true, and those who have the minimum of arable duties to perform this January will probably be glad that they made use of the good weather in early winter. It is always sound policy never to let opportunities for making use of good weather slip through one's fingers.

The extent to which arable operations are undertaken in January depends very much on the condition of the ground and the urgency of the tasks. That it is an advantage to have ground subjected to frost is generally recognized when spring tilths are required, and in view of the prevalent tendency to advance the dates at which spring cereals are sown, it is all the more essential to make speed in January if possible. Land that was cropped with roots in 1934 will not usually be deeply ploughed for spring cereals, although here again much depends on the land. It is suggested, however, that if a firm seed bed is essential for spring cereals that are to be used as nurse crops for grass

JANUARY ON THE FARM

and clover seeds, deep ploughing may make it more difficult to attain firmness. On the lighter soils firmness can be influenced by adequate rolling, but on the stickier types, this may not always be so easy unless suitable weather prevails at and after sowing.

The ploughing up of grass land and seeds leys intended for spring cereals or even roots is frequently reserved for January. This practice is normally followed by the writer where potatoes are now taken after a one-year's ley. This ground can usually be ploughed when other ground is unfit, and during the last two years subsoiling has been practised at the same time as the ley ground has been ploughed. Theoretical considerations definitely favour the practice of subsoiling, though it is too early to pass an opinion on the actual effects realized on the Midland College Farm.

January is not usually a seeding month. On the drier soils and during a suitable spell of weather it is sometimes possible to make a start with some of the hardier types of oats. The only serious drawback to these early sowings is that bird attack is often severe, while if a prolonged period of wet and cold weather ensues, germination is slow or the normal plant is severely pruned in numbers. Wheat seedings are also continued, the variety depended upon being chiefly Little Joss. Some very satisfactory wheat crops were grown on good land in 1934 from January and February seedings of Little Joss.

Other duties that fall due this month are often affected by the weather and the fact that arable operations are interrupted. Among these duties are attention to hedges, ditches and drains; application of artificial fertilizers to grass land; muck carting—especially in frosty weather; sorting and boxing of seed potatoes; threshing of spring corn; and cultural treatment of grass land. When outside duties are impossible by reason of driving rain, snow, etc., then some thought can be given to the repair of implements and equipment, the oiling of harness and the making of troughs, etc., required for live stock. The collection of fallen timber and the sawing of wood are also often a means of improving the appearance of a farm in respect of tidiness. Clearing-up days have their value and are essential on most farms.

The Lambing Pen.—The lambing season in the districts associated with arable sheep farming usually commences in

JANUARY ON THE FARM

January. The wide open arable fields make it necessary to provide shelter for the ewe flock, and the construction of the lambing pen takes place on or near the site of the food supplies available for the flock during the lambing season. The arable land sheep farmer is well trained in the practice of looking ahead, for no flock can be managed successfully unless its food supplies are adequately met. The type of lambing pen utilized varies considerably. The permanent pen is not generally regarded as satisfactory since the food supplies of the flock are not always conveniently near at hand, while old-standing disease troubles tend to complicate the management. The temporary pen suffers from none of these objections, and it is customary to have arranged for the stacking of corn near the site of the proposed pen, so that straw is available after threshing. One sometimes wonders why grass-land farmers do not make more use of shelter for their flocks at lambing time, although much depends on the season and the natural shelter available from walls, hedges, and plantations of trees.

In large flocks the ewes are divided into fortnightly batches, according to the nearness of lambing, and those nearest lambing are brought at night into the large pen, which is surrounded by sheltered pens and is bedded with straw—barley straw being very popular for this purpose. Hay is fed from racks; if the ewes at this stage are not turned out on the adjacent root area, they are given roots, kale, cabbages, etc., in the pen. As each ewe lambs, she is generally put into one of the small pens or coops—a hurdle square in size—and ewes with twin lambs are usually penned on the most sheltered side of the lambing pen. The ewes remain in the small side pens for from one to two days. This system definitely saves the shepherd trouble, because he knows with certainty the progeny of each ewe, and after the first day or two the ewes are well able to keep their lambs under their own observation.

On removal from the small pens, it is usual to put the ewes and lambs into one of two large protected pens adjacent to the central lambing pen. The one pen contains ewes with twin lambs and the other is for ewes with single lambs. This enables some discrimination to be exercised with regard to feeding, in that ewes with twins are more liberally fed. The length of time that the ewes and lambs remain in these shelter folds depends on the weather. The usual time is a fortnight to three weeks, which is the most critical

JANUARY ON THE FARM

period in the life of the young lamb, and for which a dry bed and good shelter are invaluable.

The subsequent management is to get the flock on to the more open fold, and the lambs are given the first chance of picking over the roots, etc., that support the mature sheep. They are admitted ahead of the ewes by means of lamb creeps, and if it is desired to give concentrates, these are also placed in the forward run. The favourite foods for sheep after lambing are thousand-headed kale and swedes, four rows of each being a popular mixture. The kale has an additional virtue in that its height provides a certain amount of shelter for the flock, while the ground below is kept reasonably dry.

The ordinary points of management that deserve attention at this period of year with all ewe flocks are to keep the ewes as quiet as possible, to avoid over-crowding at food troughs, and to ensure broad, clean gate-ways. Stray dogs may be a nuisance and a close eye should be kept on these. Fields that are in close proximity to public footpaths are objectionable. A good shepherd is worth a lot at this season. Many lambs and ewes can be saved by timely assistance, but cleanliness is an all-important virtue. The navel cord of each lamb should be dressed as soon as possible, tincture of iodine or copper sulphate both being widely employed for this purpose.

The Age Factor in Farming.—Perhaps one of the most arresting statements in the Agricultural Research Council's recently-issued Report relates to the influence of the age factor in farming success. Thus it is suggested that the oft-held view that farming success depends on an agricultural ancestry and the handing-on of family knowledge from one generation to another is erroneous. Support is given to this contention by the survey of East Anglian farming undertaken by the Economics Branch of the Cambridge University School of Agriculture in 1932. It appeared from this that, of farmers occupying holdings of over 1,000 acres, an inverse correlation existed between age and success, measured by farming profits. The lower the age-group, the higher the profits.

It used to be held that success in farming was largely dependent upon the capacity for sustained hard work. The individual with considerable reserves of energy united with

JANUARY ON THE FARM

a degree of enthusiasm for his job could break down many of the barriers to farming prosperity by these qualities alone. That there must be a full knowledge of the fundamentals of farming practice goes without saying, but something more is needed in these days, and especially the capacity for looking ahead and the ability to apply the knowledge that results from the researches of scientists and others. Flexibility in farming outlook is a very desirable quality to cultivate—an open mind, with the capacity to sift evidence of economic value and to apply it to one's own conditions. It is sometimes possible that enthusiasm for hard work on the part of the farmer is in itself responsible for the limitation of farming profits. This is especially so where there is labour to control and which demands adequate supervision. Farming is becoming more and more of a business, with the need for men who are versed in business methods, and it is from this angle in particular that farming operations and practices must be studied. On this basis tradition and sentiment are largely eliminated, and the key question is one of how to make farming pay. This is a matter that demands time for hard thinking—and, one may add, time for discriminating reading.

The Choice of Farming Equipment.—Among the problems confronting the young farmer who is anxious to make his capital go as far as possible is the extent to which it is desirable to make use of second-hand equipment. This is an evergreen topic that is sometimes worth a little attention. Judging by the "museum specimens" that are offered for sale in a reasonable state of repair at most farm dispersals, it is obvious that many implements have a life that exceeds the normal, based on ordinary depreciation values. An implement's life is determined largely by the care taken of it and the extent to which it has been used. This includes not only proper storage and protection from weather when not in use, but the protection of wood and iron work against decay by the use of paint when necessary, and the avoidance of undue wear by proper lubrication of wearing parts. Up to a point this kind of care is calculated to reduce the depreciation of the equipment and to add to the farming efficiency.

There is another aspect, however, that it is sometimes necessary to recognize, viz., that the economic life of an implement is determined by its capacity to do the job for

JANUARY ON THE FARM

which it was designed, with the maximum efficiency. Among the claims made for many of the new implements that have been introduced in recent years is one that concerns improvement in efficiency based on such important points as ease of draught and running, largely by the use of pneumatic tyres and roller bearings. The life of wearing parts has been similarly improved by the use of alloys and metals that resist wear to a greater degree than older types, while automatic oiling devices have similarly added to the prospective life of an implement. In the light of these facts there is greater need than ever for careful discrimination in the purchase of second-hand equipment. It is equally necessary in the purchase of new equipment to make quite certain that the larger capital expenditure will be justified by the results. This is specially true on average-sized holdings where many of the implements can never be utilized to the maximum advantage. In this sense the large-scale farmer has a decided advantage over the small farmer, since the equipment is employed to the full, and as wear and tear exact their toll, the replacements are made more frequently with modern equipment that carries with it corresponding advantages.

NOTES ON MANURING

F. RAYNS, M.A.,
Norfolk Agricultural Station,
and F. HANLEY, M.A.,
School of Agriculture, Cambridge.

Brussels Sprouts.—The total acreage of brussels sprouts, as shown in the official returns of the Ministry of Agriculture and Fisheries, has been more than trebled during the last 20 years.

Although Bedfordshire (with almost one-third of the total acreage for the country) has still the largest area, there has been a relatively greater expansion in some other counties on land formerly devoted almost exclusively to extensive agricultural crops.

This crop, therefore, is no longer entirely in the hands of growers who specialize in the production of market-garden crops. It is now grown by a wider range of cultivators, including the specialist market gardener, the market gardener with additional land hired specially for growing brussels sprouts, and the arable farmer who for various reasons has fitted vegetables into his farm rotation.

It will be immediately obvious that each of these three types of grower has his own problems—cultural, manurial, pathological and economic.

The farmer-cum-vegetable grower frequently has the advantage of being able to make profitable use of surplus crop or crop residues as keep for sheep, thereby also restoring a certain amount of fertility to his soil. This utilization of the crop residues by sheep is important, for sprouts are probably replacing a crop of sheep-keep intended (in part at any rate) to help maintain the fertility of the soil.

This type of grower must be generous with his manures if he is to succeed. Such evidence as is available points to

NOTES ON MANURING

the suitability of a complete fertilizer mixture such as the following:—

4-5 cwt. per acre superphosphate	}	worked in just before sowing or planting.
2 " " " sulphate of potash		
2 " " " " ammonia		
Up to 2 cwt. per acre of a nitrogenous top dressing applied in two doses.		

When dung is applied direct for the sprout crop (as it may be where sprouts are replacing part of the root shift), the nitrogen in the above basal dressing may be reduced, to avoid the risk of producing sprouts that are too open or loose.

The intensive market-gardener prefers to use organic manures as the basis of his manuring. This choice is based on practical experience, but there is at present little experimental evidence to support it. The grower, however, is looking farther ahead than his sprout crop; he believes in building up and maintaining a large reserve of slowly-available plant food in the soil, rather than relying on direct applications of quick-acting artificial fertilizers to supply the needs of individual crops grown in soil kept at a lower level of fertility. The beneficial effect of humus on the moisture-holding powers of the soil is also partly responsible for this preference for organic manures, especially on the lighter soils.

While it is necessary to guard against over-manuring, particularly with nitrogenous fertilizers (which may lead to the production of poor quality sprouts), brussels sprouts will always respond to liberal treatment.

Where soot, shoddy or high-grade hoof and horn are used, it is well to remember that these manures supply little else but nitrogen, though meat and bone meal, guano and fish manure contain both nitrogen and phosphoric acid. The production of early, firm and bright sprouts, attractive in appearance and maintaining their freshness even after lengthy transportation, demands adequate supplies of phosphoric acid and potash in addition to nitrogen. In many instances where the rotation is a short one and includes potatoes, there are large quantities of residual phosphoric acid from the manuring of previous crops. Where this is not so, however, and a non-phosphatic organic manure is to be used, then an additional application of 4-5 cwt. per acre of superphosphate is desirable, accom-

NOTES ON MANURING

panied by 2 cwt. per acre of sulphate of potash or their equivalent in some other form of fertilizers. Up to 2 cwt. per acre of a quick-acting nitrogenous top dressing is usually applied later in the summer as this is held to stimulate "buttoning."

Soot, in some areas, is regarded as almost essential to the successful growth of the brussels sprout crop. Again, there is no direct experimental evidence showing that the nitrogen in soot is of greater value than that in an inorganic fertilizer such as sulphate of ammonia; nor are there any precise data indicating a definitely superior quality in sprouts grown with soot, although many growers assert that it produces a better colour.

If there are any benefits other than those from the nitrogen it contains, they may be found in the possibility that soot improves the soil tilth, assists in controlling slugs or other pests, and raises the soil temperature.

It is impossible to shake the faith of the market gardener in soot at one ton or so per acre, especially on the heavier soil types.

To the farmer-cum-vegetable-grower, soot is of less importance, for he is not so likely to suffer from severe pest attack while his land is relatively "new," and the maintenance of a good soil tilth in the absence of soot presents no new problem to him.

Malting Barley.—Barley varies in price more than any other British cereal. A good sample may be worth twice as much as a poor sample. Obviously, therefore, quality is the first consideration of all barley growers in districts where the climate is suitable. Although the effects of manuring on the quality of malting barley are small compared with those of the weather they are nevertheless important. The comprehensive report of Russell and Bishop (*Journ. Inst. Brewing*, xxxix, No. 7, July, 1933) of ten years' experiments under the Institute of Brewing Research Scheme, has augmented the earlier work of Beaven, Brown and others on the influences of manuring on malting quality.

It becomes obvious to anyone reading the report that good quality is largely determined by the nitrogen content of the grain. To many, "nitrogen content" will convey

NOTES ON MANURING

very little, but everyone will recognize the factors that control it. They are the soil, season, variety and manuring, but despite this order of importance, it is possible to increase the nitrogen content of barley by errors in manuring, to such an extent that all chance of producing the best quality grain is lost. Barleys low in nitrogen are required by the maltsters. Most frequently, they are associated with poor soils, or soils in which fertility is temporarily low as when barley follows another cereal; any kind of manuring which is likely "to do the land well" will increase the nitrogen in the soil, and perhaps in the barley grain as well. We must, therefore, always treat the land carefully in preparation for barley. This care was perhaps carried to extremity by the old school of four-course-rotation barley growers who farmed always with the barley crop in mind; it did not matter in those happy days whether or not the bullocks paid, and the management of the sheep was influenced as much by their association with the barley as with the trade for wool or mutton.

There is, however, another aspect of the question; no grower can afford to neglect the yield of his barley crops—and yield is influenced more by nitrogenous than by any other manuring. In the Institute of Brewing investigations nitrogenous manuring increased the yield by 5 or 6 bushels per acre. Although phosphatic manure gave good responses on some soils, its action was not consistent and potassic manures had little effect except on the light sandy soils. Provided that the phosphatic and potassic reserves are maintained at a satisfactory level in the usual course of rotation manuring, nitrogenous manures or practices such as sheep folding (which increase the available nitrogen in the soil) are the most likely to increase the yield of barley. A uniform sample, however, is just as important as one with a low nitrogen content, and a farmer will not grow a winner for the Brewers' Exhibition if the crop fails to stand up to harvest.

It is necessary, therefore, to try and decide for every field by how much the available nitrogen in the soil may be increased in order to produce a larger crop without loss in malting value.

In practice, it means that the farmer must be extremely careful in handling the preceding crop so that he ensures soil

NOTES ON MANURING

uniformity in sheeping evenly and not too heavily; in manuring sparingly after sheep, especially after a late fold; in drilling early and applying the manures evenly on the seed bed; in remembering that manuring may be heavier after a cereal or roots carted off, than after folded roots; and in bearing in mind that in general the better the land, the more difficult it is for one to grow good samples. With these points in mind the grower may, with advantage, try to decide how heavily he may sheep or how much artificial manure he may use before the crop would go down in a normal season. He should then use a little less than his first judgment would suggest. It is often unnecessary to use artificial manures for barley: much depends upon the manuring of the preceding crop and on the fertility of the soil. On good land artificials are not usually required, except when the barley is grown after another cereal. On poor land profitable responses to manures may be obtained from barley grown after almost any crop. There is, therefore, no hard and fast solution to the problem of how to manure barley.

If it is considered desirable to use manures, the following are suitable quantities per acre: 1 cwt. of sulphate of ammonia, 3 cwt. of superphosphate, 1 cwt. of muriate of potash, or their equivalent in other appropriate manures. On many poor soils it would pay to mix the three manures and apply the full 5 cwt. per acre, but as a general rule potash need not be used except on the lighter soils, where phosphates are less important. On the other hand, sulphate of ammonia almost always increases the yield and is safe to use with either superphosphate and muriate of potash, or both if necessary, on all soils and in most instances, except after roots heavily or late sheep folded. Many of the best barley growers use sulphate of ammonia very sparingly for fear that excessive nitrogen in the soil may be reflected in excessive nitrogen in the grain. One finds them, therefore, varying the amounts of sulphate of ammonia in their mixtures between $\frac{1}{2}$ and 1 cwt. per acre and mixing separately for each field. It is simpler, however, in practice to adopt a standard barley mixture such as the one given above and to vary the quantity of the application as required.

If this procedure is adopted, and the appropriate dressings for the barley fields on the farm are, say, 3, 4 or 5 cwt.

NOTES ON MANURING

per acre respectively, the amounts of each ingredient in the formula in cwt. per acre would be:—

<i>Cwt. Mixture per acre.</i>	<i>Superphosphate.</i>	<i>Sulphate of Ammonia.</i>	<i>Muriate of Potash.</i>
3	1.8	0.6	0.6
4	2.4	0.8	0.8
5	3.0	1.0	1.0

These manures can be mixed on the farm if they are applied soon after mixing. If, however, a merchant is required to mix them he would almost certainly ask for permission to include a drier. The use of 1-2 cwt. of steamed bone flour per ton of mixture, in place of some of the superphosphate, would make no difference to the efficiency of the manure, but the mixture would become more friable, store better and sow more easily.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended December 12				
	Bristol	Hull	L'pool	London	Cost per unit at London
Nitrate of soda (N. 15½%) ..	£ 7 12d	£ 7 12d	£ 7 12d	£ 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20·6%) ..	7 0d	7 0d	7 0d	7 0d	6 10
Calcium cyanamide (N. 20·6%)	7 0e	7 0e	7 0e	7 0e	6 10
Kainit (Pot. 14%) ..	3 0	2 14	2 12	2 14g	3 10
Potash salts (Pot. 30%) ..	4 11	4 6	4 4	4 6g	2 10
" " (Pot. 20%) ..	3 12	3 6	3 3	3 6g	3 4
Muriate of potash (Pot. 50%) ..	7 4	6 16	6 12	6 16g	2 9
Sulphate " " (Pot. 48%) ..	8 3	7 18	7 12	7 18g	3 3
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26-27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 2f	2 16b	3 6
" " (S.P.A. 13½%) ..	2 17	2 11	2 18f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	..	6 17	6 15f	6 7	..
Steamed bone-flour (N. 4%, P.A. 27½-29½%) ..	5 12	5 12	5 10f	5 10	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

‡ Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

§ Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

¶ For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

|| Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. B. MERCER, M.C., B.Sc. (Principal), and Colleagues,
Cheshire School of Agriculture, Reaseheath, Nantwich.

ONE of the writers took the opportunity afforded by a recent visit to a farm institute to inquire into the system upon which farm management was there organized. "That's easily explained," said the Principal. "Here's the key," and he produced from his vest pocket a diary wherein the takings in the several sections of the farm were written up periodically.

Discussing the problem of costings with the manager of another farm—also in every sense of the term an educational farm—the same writer was told: "Yes, we keep costs, but I don't rely on them much. Income's the main thing. I know I've got to see £5,000 a year from somewhere to make ends meet. That's all I bother about."

Neither speaker expected to be taken literally; for in casual conversation, as in lapidary inscriptions, "a man is not upon oath." Both, however, were expressing a general feeling—a feeling shared by the listener, in whose own experience income stands out far above all other factors in successful farm management.

In Cheshire nearly all farming problems resolve themselves into problems of milk and cows. Every year, accounts seem to tell the same tale, the greater the income from milk the greater the prospects of profits; let but the milk-income fall and good-bye to all hope of profit. As a rule a big milk income and a big head of stock go hand in hand. Of course it is easy to show on paper that the cows and the profits are not necessarily cause and effect; but the evidence, such as it is, certainly points that way.

At the moment density of stocking is of especial interest by reason of the price levels of foodstuffs and milk respectively. Milk is selling relatively well: foodstuffs are relatively cheap. There is need for revision of accepted creeds concerning the use of concentrated feeds for stock. In this particular, agricultural educationists have almost boxed the compass in the space of fifty years. Themselves pioneers in the use and advocacy of "artificial" supplements to home-grown rations, they soon found their words taken up

NOTES ON FEEDING

and amplified. With artificial feeding a new force arose in British agriculture, a force destined soon to become the greatest single one in stock farming—namely, that of the foodstuffs trade. It was not long, therefore, before the promulgators were compelled to preach moderation. Latterly perhaps the cautionary element has outweighed the commendatory in most educationists' preaching. Much of our teaching has been based on the assumption that home-produced foods were necessarily cheaper than those bought in. Nearly all our standard rations are based on the idea of meeting maintenance requirements with home-grown fodders. Not until we discovered that heavy-yielding cows could not be rationed on this basis did we think of maintenance diets as consisting partly of purchased foods.

The present trend of index prices does not, however, suggest that home-grown foods are necessarily cheaper than purchased ones, since the latter stand at less than pre-War level, while labour, a big component in the cost of crops, is at least doubled.

Hitherto it has been accepted—tacitly at any rate—that the number of stock kept on a farm was determined by the amount of maintenance produce that the farm could yield. If, however, it be true that purchased foods are as cheap as those grown on the farm, then that rule clearly ceases to hold good, and there is no limit to the number of stock that can be economically carried on a given holding (or rather the limit is not prescribed by foods). A dairy farmer, for instance, who has been in the habit of keeping 40 cows can with safety increase that number to 50, secure in the knowledge that the additional 10 will not cost more per head to feed than the basal 40.

Costs of Home-produced and Purchased Foods.—Exact comparison of foodstuffs differing so widely in composition as, say, hay and linseed cake, is as difficult as the comparison of farmyard manure with artificials. Allowing, however, for the flexibility of rations and for the fact that, no matter what conclusion one may arrive at, a mixture of home-grown and concentrated foods will have to be used, a comparison of the two groups on the basis of their respective starch equivalent contents seems legitimate.

The average cost of a lb. or a cwt. of starch equivalent in the form of concentrated foods can be calculated fairly easily. At present a representative mixture of concentrates

NOTES ON FEEDING

used on a dairy farm costs 10s. per cwt. of starch equivalent, or about 9s. per cwt. if allowance be made for manurial value. The relative figure for home-grown foods is much more difficult to arrive at, partly because the path lies through the morass called crop costing, partly on account of the variable composition of the crops when grown.

We have attempted to calculate the average costs per cwt. of starch equivalent of crops produced on our own farm, basing the calculations on the average expenditure and average yields for the past 5 years; and after certain small adjustments,* due to the peculiar circumstances of this particular farm, these costs have been brought together in two groups, the one appertaining to pasture, the other to fodder land, i.e., arable and meadow hay land:—

	102½ ac. Pasture.	66½ ac. Fodder land (excl. Wheat and Potatoes).	Total.
Rent	207.5	107.00	314.50
Seeds .. .	—	21.75	21.75
Artificials .	36.5	48.75	85.25
Implements dep.	12 0	73 75	85.75
Threshing .	—	6.50	6.50
Horse labour .	5.5	61.75	67.25
Labour .. .	13 0	179 75	192.75
Deduction for straw	£274.5	£499.25 19 50	£773.75 19.50
Total (excluding F.Y.M.)		£479.75	£754.25
Total S.E. produced (cwt.) ..	1,230	778	
Cost per cwt. S.E.	4s. 5½d.	12s. 4d.	
Total including F.Y.M. ..	£299	£573.75	£872.75
Cost per cwt. S.E. . . .	4s. 10d.	14s. 8d.	8s. 8d.

Yields of fodder crops are calculated from the actual quantities fed to stock and represent therefore yields as carted from the fields less shrinkage in stack or clamp and handling waste.† The yield from pastures has been estimated from the returns obtained on small plots hand-mown at intervals. It is the least satisfactory figure in the whole table, though the most reliable estimate we can obtain.

Before discussing the implications of this table it may be well to dispose of two points concerning the method of assessment of the costs.

* The only material adjustment has consisted in cutting out the salary of the bailiff.

† Most published figures on crop costs appear to relate to the tonnage grown or carted from the field. Hay however loses about one-third of its weight in the stack; the wastages of corn in stack and granary, roots in clamp, and kale as it stands in the field are all very considerable.

NOTES ON FEEDING

Farmyard Manure.—It is sometimes argued that as manure is a by-product of milk production its cost should not be included in the cost of producing crops. This argument is particularly weighty in the case of a farm carrying a large herd of pigs; here the arable crops (and through the crops, the cows) find themselves, willy-nilly, burdened with a by-product of pig keeping at a price fixed by the pigs.

On the other hand, it is incontestable that the yield of the crops is determined in great measure by the amount of farmyard manure applied; the said manure owing its potency mainly to the purchased foods. Hence in considering the relative costs of purchased and home-grown foods it seems unavoidable to make *some* charge; and if the full tenant right value is not charged, what figure ought to be adopted? For our own part we prefer to charge for the farmyard manure at its full paper value if only to remind ourselves that it has, on entry to the farm, been paid for at such valuation, in cash. Moreover, its inclusion has the effect of calling attention to the undoubted fact that in stock farming there is at present no known method of recovering in cash the values attributed to this by-product. Fortunately for our present purpose its inclusion or exclusion does not materially alter the main deduction.

Labour.—"Oh, but you can't charge labour to the arable crops. Most of it is the spare-time labour of stockmen." To this argument we reply (1) that the facts are not as stated, most of the labour being either that of horse-men engaged as such—or overtime of other men; (2) that even if the labour were indeed spare-time labour, it has been paid for in cash, and if it is not charged to the crops, it can only be charged to the cattle. It seems to us a dangerous practice to debit direct to the stock a charge which has in the first place been expended on the crops.

There is, however, one instance in which this method of argument may legitimately be employed, the case of the smallholder, growing crops by his own and other unpaid labour. The main end in view on a small farm is to obtain a cash return for family labour; crop growing represents a means of achieving this end; and one gets nearer to realities by saying that, in such work a return of *x*d. per hour has been obtained than by attempting to calculate the costs per ton of food produced. By the same reasoning, costs of crop production can on many farms be reduced by the

NOTES ON FEEDING

omission of that portion of the labour actually performed by the farmer or unpaid members of his family. Nevertheless, it appears to us desirable in a discussion of this kind to regard all labour actually employed in crop production as paid labour.

The table brings to light some of the inherent weaknesses of a system of farming involving a big head of stock and a limited area of arable land.

It may be argued (as the farm in question belongs to a county council it certainly *will* be argued!) that the labour has been wastefully employed. This appears to us perfectly true—labour employed in crop production on the small scale that dairying implies is uneconomically used; yet a simple calculation from the table will show that even if all labour charges were cut out, the cost per cwt. of starch equivalent in fodder would still be as high as in purchased foods. The charge for implements also reveals the extent to which a farm with only a small arable area suffers under this head.

For the purposes of the present discussion the broad conclusions to be drawn from the table are that on the farm in question grass is a very cheap food, and that fodder generally is produced at rates measurably above the rates at which starch equivalent in other forms could be purchased. More detailed calculations we have made indicate that the costs of the several crops included in the term fodder vary considerably; ranging from seeds hay at the one extreme to swedes at the other. The precise evaluation of the costs of individual crops, however, turns on very debatable points, such as the exact credit due to roots for their cleaning value, the spread of farmyard manure costs over a rotation, and so on. They do not suggest that very material alterations in the cost of feeding cattle could be made by variations in the rotation, and they certainly imply that as long as farmyard manure is used freely on meadows for hay, hay must prove a dear food. They do, however, suggest that true economy consists in pushing yields per acre to the uttermost limit.

Intensity of Stocking.—We return then to the original question of the economics of heavy stocking, and it may aid the discussion if we give the following typical statement of

NOTES ON FEEDING

the annual costs of keeping a dairy herd (based on the cost records for our own herd*):—

Cows Account (70 cows).

To pasture (including labour, £12)	183	Manurial Res. ..	80
Fodder (" " £255)	428	Calves	80
Concentrates	586	Milk—	
Labour	260	600 gal. at 10d.	
Depreciation	256	net	1,750
Incidentals	120		
Totals	£1,833		£1,910

Assuming that accommodation could be found for a further 10 cows on this holding, what would be the effect on the accounts? That is the type of question every stock farmer finds himself asking.

The question introduces a good many factors, but by far the most important is the cost of feeding. We may in the first place dismiss the question of keeping additional stock entirely on concentrates. Since the all-over cost of home-grown foods (i.e., including pasturage) is 8s. 8d. per cwt. of starch equivalent, it is clear that the profits *pro rata* would be reduced by adding stock fed entirely on foods at 10s. per cwt.

Artificial foods can economically be used only as a substitute for winter fodder. The question of usefully employing more concentrates turns therefore on the possibility of increasing the supply of summer keep. In other words, the proposal involves either extending the pasture area or intensively manuring the grass. Of the two, the latter appears to us the more attractive.

From experiments we have carried out it seems certain that the yield from our pastures could be increased by at least one-sixth, by the application of nitrogen at the rate of 10s. per acre. An increase of one-sixth is equivalent to 200 cwt. of starch equivalent.

A cow consumes on the average about 11 lb. of starch equivalent per day, or 36½ cwt. per year; of which some 15 cwt. are consumed during the summer grazing period and the remainder in winter. It seems safe to conclude therefore that the expenditure of 10s. per acre on nitrogen

* Substantially the actual figures for the year 1933-4, but we have modified them slightly where owing to special circumstances they are known to be markedly higher or lower than average.

NOTES ON FEEDING

would at least provide the summer keep for the hypothetical 10 cows, leaving only 21 cwt. of starch equivalent apiece, to be provided by purchase of concentrates at a cost of approximately £105. The additional costs and returns, even if labour and incidentals increased proportionately, would therefore be:—

Additional Costs and Returns.

	£		£
Pasturage costs	37	Manurial residue	10
Foodstuffs	105	Calves	12
Depreciation	35	Milk (600 gal. at 10d.)..	250
Labour and incidentals ..	54		
	£231		£272

The conclusion is of course applicable, in the first place, to one particular farm. How far it may be applicable to other farms of a similar type, still more to farms of a different kind, it is extremely difficult to say without detailed cost accounts. We have endeavoured from the ordinary financial accounts of 20 dairy farms in our neighbourhood, to which we have had access, to calculate costs of home-grown foods, from the stock kept and concentrates purchased. The calculations are involved and in many ways unsatisfactory, but the result, for what it is worth, definitely supports our general finding. We are aware that this argument might not apply at all to farms organized on a different basis. We find, however, that it is impossible to escape the conclusion that, in existing circumstances, the use of purchased foods for the winter maintenance of dairy stock is as much justified as the use for winter production. This fact, combined with the reasonable certainty that most of the pastures of the country would respond to nitrogenous manuring, justifies the maintenance of a heavy head of stock by means of purchased concentrates. It is a big factor encouraging more level output of milk.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British	£ 5 0	0 8	£ 4 12	72	s. 1 3	d. 0-67	% 9-6
Barley, British feeding	5 15	0 7	6 8	71	1 10	0-98	6-2
" Canadian, No. 3 Western ..	7 0	0 7	6 13	71	1 10	0-98	6-2
" " No 4 Western ..	6 5½	0 7	5 18	71	1 8	0-89	6-2
" Persian	6 8½	0 7	6 1	71	1 8	0-89	6-2
" Polish	6 7	0 7	6 0	71	1 8	0-89	6-2
Oats, English white	7 0	0 8	6 12	60	2 2	1-16	7-6
" " black and grey ..	7 0	0 8	6 12	60	2 2	1-16	7-6
" Scotch White	7 13	0 8	7 5	60	2 5	1-29	7-6
" Canadian No. 2 Western ..	7 17	0 8	7 9	60	2 6	1-34	7-6
" " mixed feed	6 7	0 8	5 19	60	2 0	1-07	7-6
" Chilian	7 15	0 8	7 7	60	2 5	1-29	7-6
Maize, Argentine	5 5	0 6	4 19	78	1 3	0-67	7-6
" Danubian Gal. Fox	5 3½	0 6	4 17	78	1 3	0-67	7-6
" South African, No. 2 White Flat	5 12½	0 6	5 6	78	1 4	0-71	7-6
" South African, No 4 Yellow	5 7½	0 6	5 1	78	1 4	0-71	7-6
Beans, English, winter	5 10½	0 15	4 15	66	1 5	0-76	19-7
Peas, English, blue	9 10½	0 13	8 17	69	2 7	1-38	18-1
" Japanese	15 10½	0 13	14 17	69	4 4	2-32	18-1
Dari	7 2½	0 7	6 15	74	1 10	0-98	7-2
Milling offals—Bran, British	6 5	0 14	5 11	43	2 7	1-38	9-9
" " broad	6 15	0 14	6 1	43	2 10	1-52	10
" Middlings, fine, imported	6 5	0 12	5 13	69	1 8	0-89	12-1
" Weatings†	6 5	0 12	5 13	56	2 0	1-07	10-7
" " Superfine†	6 17	0 12	6 5	69	1 10	0-98	12-1
" Pollards, imported	6 2	0 12	5 10	50	2 2	1-16	11
Meal, barley	8 0	0 7	7 13	71	2 2	1-16	6-2
" " grade II	7 5	0 7	6 18	71	1 11	1-03	6-2
" " maize	5 17	0 6	5 11	78	1 5	0-76	7-6
" " South African ..	5 10½	0 6	5 4	78	1 4	0-71	7-6
" " germ	6 0	0 10	5 10	79	1 5	0-76	8-5
" locust bean	7 10	0 5	7 5	71	2 1	1-12	3-6
" bean	8 5	0 15	7 10	66	2 3	1-21	19-7
" fish, white	15 15	1 19	13 16	59	4 8	2-50	53
Maize, cooked, flaked	6 10	0 6	6 4	84	1 6	0-80	9-2
" " gluten feed	6 0	0 12	5 8	76	1 5	0-76	19-2
Linseed cake, English, 12% oil	9 2	0 18	8 4	74	2 3	1-21	24-6
" " " 9%	8 15	0 18	7 17	74	2 1	1-12	24-6
" " " 8%	8 10	0 18	7 12	74	2 1	1-12	24-6
" " " 6%	8 12½	0 18	7 14	74	2 1	1-12	24-6
Soya-bean cake, 5½% oil ..	7 12½	1 6	6 0	69	1 10	0-98	36-9
Cottonseed cake—English, Egyp- tian seed, 4½% oil	4 15	0 16	3 19	42	1 11	1-03	17-3
" " Egyptian, 4½% ..	4 12	0 16	3 16	42	1 10	0-98	17-3
" " decorticated, 7% ..	7 0½	1 6	5 14	68	1 8	0-89	34-7
" " meal, decorticated, 7% ..	7 0½	1 6	5 14	68	1 8	0-89	34-7
Coconut cake, 6% oil	6 12	0 16	5 16	77	1 6	0-80	16-4
Ground-nut cake, decor., 6-7% oil	7 5	1 6	5 19	73	1 8	0-89	41-3
" " " imported, " " decorticated, 6-7% oil	6 5	1 6	4 19	73	1 4	0-71	41-3
Palm-kernel cake, 4½-5½% oil ..	6 5½	0 11	5 14	73	1 7	0-85	16-9
" " " meal, 4½% oil	6 5½	0 11	5 14	73	1 7	0-85	16-9
" " " meal, 1-2% oil ..	5 17	0 11	5 6	71	1 6	0-80	16-5
Feeding treacle	5 0	0 7	4 13	51	1 10	0-98	2-7
Brewers' grains, dried ale ..	5 17	0 10	5 7	48	2 3	1-21	12-5
" " " porter	5 10	0 10	5 0	48	2 1	1-12	12-5
Dried sugar beet pulp (a) ..	5 7	0 5	5 2	66	1 7	0-85	5-2

(a) Carriage paid in 5 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of November, 1934, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 18s. per ton as shown above, the food value per ton is £9 ss. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is ss. 6d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.34d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 6d.; P₂O₅, 2s. 2d. K₂O, 2s. 11d.

FARM VALUES OF FEEDING STUFFS

Farm Values. —The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	6 10
Maize	78	7.6	5 7
Decorticated ground-nut cake	73	41.3	6 15
„ cotton cake	68	34.7	7 0

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.65 shillings, and per unit protein equivalent, 0.82 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1934, issue of the Ministry's JOURNAL, p. 808.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 7
Oats	60	7.6	5 5
Barley	71	6.2	6 2
Potatoes	18	0.8	1 10
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 12
Beans	66	19.7	6 5
Good meadow hay	37	4.6	3 5
Good oat straw	20	0.9	1 14
Good clover hay	38	7.0	3 8
Vetch and oat silage	13	1.6	1 3
Barley straw	23	0.7	1 19
Wheat straw	13	0.1	1 2
Bean straw	23	1.7	1 19

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

Wart Disease Immunity Trials, 1935

THE Ministry will continue during the coming season to test, at the Potato Testing Station of the National Institute of Agricultural Botany at Ormskirk, Potatoes and Potato Seedlings as to their immunity from or susceptibility to Wart Disease on the conditions stated below.

The entry form (No. 345 H.D.), obtainable from the Ministry should be filled up and returned to the Potato Testing Station, Ormskirk, Lancs., *with the requisite fees*. Samples must be sent to that Station *as early as possible, but in any case not later than March 1*.

Potatoes are accepted from *English, Scottish and Irish growers* for trial under the following conditions:—

(a) Quantity of each stock of Potato to be sent for the first time—50 seed size tubers.

Quantity of each stock of Potato to be sent for the second and for subsequent years—35 seed size tubers.

(b) Fees on the following scale are payable in respect of each stock of Potato when first entered for immunity trials.—

Less than 5 samples from one grower 10s. per sample.

5 samples or more from one grower 8s. per sample up to 20, and 6s. for each sample in excess of 20.

These fees are not returnable in any circumstances

(c) The Ministry, while taking reasonable precautions to secure satisfactory growth, can accept no responsibility for the failure of any variety.

(d) The Ministry will take all reasonable precautions to secure that all the produce of the trial plots is fed to stock after being thoroughly mixed together, except such portions as may be needed for exhibition or scientific purposes authorized by the Ministry. The Ministry, however, reserves the right to send tubers from the produce grown at Ormskirk for testing at the official stations of the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland.

(e) All stocks entered for the trials will be tested both in the laboratory and in the field. When the Ministry is satisfied as a result of the trials that a variety is immune from Wart Disease, it will formally "approve" the variety and will issue an official certificate of immunity. Such certificates will not be issued until the variety has been named and until an assurance has been received from the sender that it has been, or is about to be, introduced into commerce. *When a variety tested under a number or letter has been subsequently named and "approved," a sample of 100 tubers of the variety as named must be sent to Ormskirk for comparison with the tested stock.* No certificate will be issued for any new variety until it has passed at least two consecutive years' tests without contracting the disease and has been declared by the Synonym Committee of the National Institute of Agricultural Botany to be distinct from existing varieties.

MISCELLANEOUS NOTES

Potatoes are accepted *from foreign growers* on the conditions (a) to (d) set out above, but no foreign variety will be formally "approved" and no certificate will be issued until the variety is definitely introduced into commerce in Great Britain.

Trials of Seedlings.—The Ministry desires to encourage the breeding of new varieties of potatoes, and in order to provide information for breeders of seedlings it is prepared to accept not fewer than two tubers, and not more than ten tubers, of any seedlings for testing in the laboratory and growing for one season on the trial plots, and to furnish a report on the results obtained, without payment of a fee. These tests, however, will not be considered as forming part of the Immunity Trials proper, and will not be reckoned in the minimum period of two years referred to under (e). The results of these tests will not be included in any report issued by the Ministry.

GENERAL INSTRUCTIONS: *Carriage.*—Small consignments should be sent by passenger train, carriage paid, or by parcel post; larger consignments should be forwarded by goods train, carriage paid.

Labels.—All consignments should be distinctly labelled. A label bearing the name and address of the sender and name of variety or seedling number should be firmly tied to the bag; in addition a similar label should be placed inside the bag.

Address.—All consignments should be addressed to:—

THE SUPERINTENDENT,
POTATO TESTING STATION,
NATIONAL INSTITUTE OF AGRICULTURAL BOTANY,
ORMSKIRK, LANCs.

Station: Ormskirk, L.M. & S. Railway.

Date of Forwarding.—Consignments should be sent so as to reach the Testing Station as early as possible, and in any case not later than March 1.

The Agricultural Index Number

THE November index number of the prices of agricultural produce at 114 (corresponding month of 1911-13 = 100) was 1 point below the previous month, but was 5 points higher than in November, 1933. Changes in prices during the month under review were again numerous, but as a rule were of a comparatively small character. Lower prices for barley, fat cattle and potatoes were the factors mainly responsible for the decline of 1 point in the general index, these decreases being offset to some extent by increases in the prices of fat pigs and hay.

MISCELLANEOUS NOTES

Monthly index numbers of prices of Agricultural Produce.
(Corresponding months of 1911-13 = 100.)

Month.	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	108
April	146	137	123	117	105	111
May	144	134	122	115	102	112
June	140	131	123	111	100	110
July	141	134	121	106	101	114
August	152	135	121	105	105	119
September	152	142	120	104	107	119
October	142	129	113	100	107	115
November	144	129	112	101	109	114
December	143	126	117	103	110	—

Grain.—At 4s. 11d. per cwt. the average for wheat showed a fall of 1d. and the index declined 1 point to 66. If allowance is made for the “deficiency payment” under the Wheat Act, 1932, the index would be increased to approximately 127, the effect of which would be to raise the general index for agricultural produce from 114 to 118. Quotations for barley declined further, a drop of 7d. to an average of 8s. 10d. per cwt. causing the index to fall 7 points to 104. The average for oats at 6s. 7d. per cwt., however, was 1d. above the previous month, but the index at 94 was unaltered. In November, 1933, wheat was selling at 4s. 7d., barley 9s. 4d., and oats 5s. 4d. per cwt., the indices being 61, 110 and 76 respectively.

Live Stock.—Values for fat cattle continued to decline during the month under review and the average of 32s. per live cwt. for second quality was 7d. lower; the index depreciated 1 point to 96. A year ago the average price was 33s. 4d., and the index stood at 100. Prices of fat sheep were unchanged during November, but as values rose in the corresponding month of the base period the index moved downwards by 5 points to 123. Bacon pigs, following upon last month’s drop, were 2d. per score dearer, and the index at 103 was 4 points higher. Values for pork pigs showed a seasonal rise and were 9d. per score dearer, the index advancing 6 points to 118. Dairy cows and store cattle were cheaper and the indices for both classes were 2 points lower on the month at 105 and 83 respectively. Store sheep were dearer, but as the increase which occurred in the base period was proportionately larger, the index at 107 was 7 points lower. Store pigs were a little cheaper, but the index advanced 4 points to 147 as the decline during the month under review was less pronounced than that in 1911-13.

MISCELLANEOUS NOTES

Dairy and Poultry Produce.—Wholesale contract prices for the sale of milk as liquid during November were the same as in October and the index at 161 was unaltered. Butter averaged $\frac{1}{4}$ d. per lb. more, but the index was 1 point lower at 83. Eggs, as is customary at this season, were much dearer, but, as in the case of butter, the advance of about 4d. per dozen was less pronounced than in the base period, and the index at 111 was 4 points lower. Cheese showed little material change either as regards price or index. Prices of fowls and ducks were unaltered, but geese were cheaper, and the combined index for poultry declined by 2 points to 114.

Other Commodities.—Quotations for potatoes declined further during November, and the index at 146 was 5 points lower than in the previous month, whereas a year ago there was a rise from 110 to 115. Prices for hay continued to advance a little and the index was 3 points higher. Wool was unchanged on the month. Apples were dearer than in the previous month, while the general index for vegetables also was higher.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1932	1933	1934			
	Nov.	Nov.	Aug.	Sept.	Oct.	Nov.
Wheat	72	61	64	68	67	66
Barley	86	110	123	127	111	104
Oats	85	76	92	98	94	94
Fat cattle	101	100	106	104	97	96
„ sheep	87	110	128	124	128	123
Bacon pigs	85	104	103	102	99	103
Pork „	92	118	108	109	112	118
Dairy cows	117	107	104	105	107	105
Store cattle	97	85	85	88	85	83
„ sheep	70	90	104	113	114	107
„ pigs	95	144	139	142	143	147
Eggs	112	108	119	103	115	111
Poultry	121	120	116	117	116	114
Milk	152	161	168	168	161	161
Butter	97	95	92	87	84	83
Cheese	115	105	96	94	93	93
Potatoes	123	115	153	158	151	146
Hay	67	78	101	104	101	104
Wool	62	81	87	87	85	85

Revised index numbers due to Wheat Act payments.

Wheat	131	127	119	127	128	127
General Index	105	113	123	123	119	118

MISCELLANEOUS NOTES

Research into Brood Diseases of Bees at Rothamsted

THE investigation into Brood Diseases of Bees at the Rothamsted Experimental Station is being carried out under the ægis of an advisory committee of scientists and bee-keeping experts composed as follows:—

Sir John Russell, Director of the Station (Chairman).

Miss A. D. Betts, Editor of *The Bee World*.

Professor J. C. G. Ledingham, Director of the Lister Institute.

Dr. H. L. Schütze, Department of Bacteriology, Lister Institute.

Mr. J. C. F. Fryer, Director of the Plant Pathological Laboratory, Ministry of Agriculture.

Dr. A. L. Gregg, of London (representing the British Beekeepers' Association).

Mr. Gilbert Barratt, of Ropley, Hampshire.

Brother Adam, of Buckfast Abbey, Devon.

Mr. B. C. Berkeley, County Beekeeping Instructor for Berkshire.

Dr. F. Thompson, Epsom (representing *Bee Craft*).

Mr. W. Herrod Hemsall, Technical Adviser in Beekeeping to the Ministry of Agriculture.

Mr. J. Price, County Beekeeping Instructor for Staffordshire.

Dr. C. B. Williams, Head of the Entomological Department, Rothamsted Experimental Station (Secretary).

Mr. D. M. T. Morland, Bee Research Laboratory, Rothamsted.

Dr. H. L. A. Tarr, Bacteriologist for Foul Brood Investigation, Bee Research Laboratory, Rothamsted.

The cost of the work is being met from a fund provided partly by beekeepers, the British Beekeepers' Association having undertaken to raise the sum of £250 per annum, and partly by the Agricultural Research Council, which is providing an equal amount. Towards the fund opened to provide the necessary capital expenditure (about £150), the Editor of *Bee Craft* has sent £50 contributed by readers of that Journal, the "Bear Honey Company" has subscribed £10 10s., and small contributions have raised the total to £62 2s. In addition, a gift of 15 colonies of bees, together with the hives, has been received from the Rt. Hon. Sir Ralph Paget, of Kingston Hill, Surrey. The Advisory Committee express their sincerest thanks to all the contributors, but desire to remind beekeepers that further help is required. Donations may be sent to the British Beekeepers' Association, 23, Bedford Street, Strand, London, W.C.2; to the Editor of *Bee Craft*, The Knoll, Church Avenue, Sidcup, Kent; or to The Director, Rothamsted Experimental Station, Harpenden, Herts.

The investigation has now been in progress for six months, during which time Dr. Tarr, the bacteriologist appointed under the scheme, has made definite progress in diagnosing the different brood diseases and in making successful inoculations both in the laboratory and under field conditions.

MISCELLANEOUS NOTES

In consequence of the success of the Conference on "Brood Diseases of Bees," held at Rothamsted in May last, it has been decided to hold another conference at Rothamsted on Saturday, May 5, 1935, when the "Causes and Control of Swarming" will be discussed.

Farm Workers' Minimum Rates of Wages.—Meetings of the Agricultural Wages Board were held at King's Buildings, Smith Square, London, S.W.1, on December 10 and 21, 1934, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders:—

Berkshire.—An Order fixing minimum and overtime rates of wages to come into force on December 30, 1934 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until December 28, 1935. The minimum rates for male workers of 21 years of age and over are 30s. per week of 48 hours (instead of 50 as at present) in winter and 50 hours in summer, except in the weeks in which Good Friday, Whit Monday and Christmas Day fall when the hours are 41, with overtime throughout the period at 8½d. per hour as at present. The minimum rate for female workers of 19 years of age and over is unchanged at 5d. per hour.

Cornwall and Isles of Scilly.—An Order fixing minimum and overtime rates of wages to come into force on December 23, 1934, (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 21, 1935. The minimum rates for male workers of 21 years of age and over are 32s. (instead of 31s. as at present) per week of 51 hours, except in the week in which Christmas Day and Boxing Day fall when the hours are 33, and in the weeks in which New Year's Day, Good Friday and Whit Monday fall when the hours are 42. The overtime rates for male workers of 21 years of age and over remain unchanged at 9d. per hour on weekdays and 10d. per hour on Sundays. The minimum rate for female workers of 20 years of age and over is 5d. per hour for all time worked.

Derbyshire.—An Order fixing minimum and overtime rates of wages to come into force on December 26, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 25, 1935. The minimum rates for male workers of 21 years of age and over are 8d. (instead of 7½d. as at present) per hour for a week of 54 hours, with payment for overtime (i.e., employment on Sundays) unchanged at 10d. per hour. For female workers of 18 years of age and over the minimum rate is unchanged at 5d. per hour with payment for overtime (i.e., employment on Sundays) unchanged at 8d. per hour.

Hampshire and Isle of Wight.—An Order continuing the operation of the existing minimum and overtime rates of wages from December 30, 1934 (i.e., the day following that on which the existing rates are due to expire) until March 2, 1935. The minimum rates for male workers of 21 years of age and over are 30s. 6d. per week of 48 hours with overtime at 8d. per hour except in the case of carters, cowmen, shepherds and milkers for work in connexion with the immediate care of animals, in which case the overtime rate is 7½d. per hour. The minimum rate for female workers of 18 years of age and over is 5d. per hour for all time worked.

Norfolk.—An Order fixing minimum and overtime rates of wages to come into operation on December 30, 1934 (i.e., the day

MISCELLANEOUS NOTES

following that on which the existing rates are due to expire) and to continue in force until December 28, 1935. The minimum rates for male workers of 21 years of age and over are 31s. 6d. (instead of 30s. as at present) per week of 48 hours in winter (except in the week in which Christmas Day falls when the hours are 49), and 50 hours in summer (except in the week in which Good Friday falls when the hours are 42), with an addition in the case of workers employed as teamsmen, cowmen, shepherds or yardmen, 5s. 6d. per week, and in the case of sheep tenders, and bullock tenders, 4s. 6d. per week in lieu of overtime in respect of work in connexion with animals, other than such work on Good Friday and Christmas Day in respect of which an additional sum of 5s. is payable, except where a day's holiday on full pay is given in the weeks in which those holidays fall or in the weeks following. The overtime rates for male workers of 21 years of age and over are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays. The minimum rate for female workers of 18 years of age and over is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays as at present.

Wiltshire.—An Order fixing minimum and overtime rates of wages to come into force on December 30, 1934 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 28, 1935. The minimum rates for male workers of 21 years of age and over are 31s. (instead of 30s. as at present) per week of 50 hours, except in the weeks in which Good Friday and Christmas Day fall when the hours are 41, with overtime throughout the period unchanged at 8d. per hour, except that for overtime employment on harvest work in the hay and corn harvests the rate is 9d. per hour. The minimum rate for female workers of 18 years of age and over is unchanged at 5d. per hour.

Yorkshire (North Riding).—An Order varying as from December 23, 1934, the existing minimum and overtime rates of wages, the rates as varied to continue in operation until November 23, 1935. The minimum rate for male workers of 21 years of age and over (other than casual workers) is 32s. 6d. (instead of 31s. 6d. as at present) per week of 50 hours in winter, except in the week in which Christmas Day falls when the hours are 41 (instead of 50 hours throughout winter as formerly), and 52½ hours in summer with payment for employment in connexion with the care of and attendance upon animals where the total hours exceed the number mentioned above unchanged at 3d. per hour for those workers who are boarded and lodged by their employer, and 6d. per hour for those who are not so boarded and lodged. The differential rates for overtime employment are 9d. per hour on weekdays and 11d. per hour on Sundays and Christmas Day. For male casual workers of 18 years of age and over the minimum rate is unchanged at 7d. per hour for all time worked. For female workers of 18 years of age and over the minimum rate is 6d. per hour. For whole-time female workers provision is made for payment at not less than 22s. per week of 36 hours in the week in which Christmas Day falls and 44 hours in any other week, with overtime at 9d. per hour.

Enforcement of Minimum Rates of Wages.—During the month ending December 8, legal proceedings were taken against nine employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board, and against another employer for refusing information and documents. Particulars of the cases follow:—

APPOINTMENTS

Committee Area.	Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
Yorks, W.R....	Bradford ...	£ s. d. 4 0 0	£ s. d. 18 0	£ s. d. 36 0 0	1
Pembroke ...	Pembroke	*	13 6	5 0 10	1
Norfolk ...	Terrington	4 0 0	9 2	7 16 0	1
	St. Clement				
" ...	"	4 0 0	8 6	8 2 1	2
Salop ...	Clun ...	†2 0 0	2 2 0	—	—
Herefords ...	Leominster	2 0 0	7 6	8 0 0	2
Denbighs ...	Ruthin ...	10 0	—	6 2 6	1
Cheshire ...	Wilmslow	‡	10 0	15 0 0	1
Yorks, W.R....	Barnsley ...	*	2 19 6	9 0 0	2
Notts... ..	Retford ...	5 0 0	—	42 16 6	1
		£21 10 0	8 8 2	137 17 11	12

* Dismissed under Probation of Offenders Act.

† Refusing information and documents.

‡ Dismissed on payment of costs.

APPOINTMENTS

County Agricultural Education Staffs

ENGLAND

Cheshire.—Miss U. M. Heler has been appointed temporary Student Demonstrator in Poultry Husbandry.

Miss J. H. Schofield has been appointed temporary Student Demonstrator in Horticulture.

Cornwall.—Mr. H. W. Sayer has been appointed Head Gardener and Instructor at the Gulval Experimental Station, *vice* Mr. D. McGregor.

Essex.—Mr. E. MacNab, M.R.C.V.S., has been appointed Lecturer in Veterinary Hygiene.

Lincolnshire (Lindsey).—Mr. W. A. Buckpitt, B.Sc., N.D.A., has been appointed temporary Assistant Agricultural Organizer.

Nottinghamshire.—Mr. G. F. Kingston, M.A., has been appointed Assistant Agricultural Organizer, *vice* Mr. K. D. R. Davis, M.A.

Miss J. E. Jeffery, N.D.D., has been appointed Assistant Instructor in Dairying and Poultry-keeping, *vice* Miss A. A. Shearman, N.D.D.

Oxfordshire.—Mr. W. H. C. Bevan, F.R.H.S., has been appointed Instructor in Horticulture, *vice* Mr. S. Heaton.

Miss M. Purcell, N.D.D., N.D.P., has been appointed Assistant Instructor in Dairying and Poultry-keeping, *vice* Miss D. V. S. Lamb, N.D.D.

Yorkshire.—Mr. J. Rhodes has been appointed Instructor in Horticulture.

Mr. A. G. Jeffery, B.Com. (Leeds), has been appointed temporary Research Assistant in Agricultural Economics.

WALES

Denbighshire.—The appointment of Mr. A. W. Jones, N.D.P., as County Poultry Instructor has been made permanent.

Monmouthshire.—Mr. W. H. C. Bevan, F.R.H.S., Senior Horticultural Instructor, has resigned.

Pembrokeshire.—Mr. M. C. Morgan, N.D.P., has been appointed County Poultry Instructor, *vice* Miss M. P. Bally, N.D.P., resigned.

NOTICES OF BOOKS

A Summary of Food Laws and Regulations. By C. L. Hinton, F.I.C. Pp. vii+90. (London: The Nema Press Ltd., 33, Tothill Street, Westminster, S.W.1. 1934. Price 21s.)

The published price of this book, reviewed in the November, 1934, issue of this JOURNAL, was, by a regrettable error, stated as 2s., whereas the correct price is 21s. Readers are kindly asked to note this correction.

Practical Bacteriology: an Introductory Course for Students of Agriculture. By Andrew Cunningham, D.Sc. Second Edition, revised and enlarged. Pp. viii+203, and 26 figs. (Edinburgh and London: Oliver & Boyd. 1934. Price 7s. 6d.)

The first edition of this little manual was possibly one of the two best textbooks on practical agricultural bacteriology; revised and brought up to date, it might have become second to none. Unfortunately, the simplicity and clarity of the first edition have now been sacrificed without a corresponding gain except in bulk and complexity of text. The frequent use of cross references and quotation marks suggests an attempt at precision, but much is left unco-ordinated and unexplained: thus, on page 5 the beginner is told to select a number of colourless, cordate tubes. This recommendation occurs in a section on hydrogen-ion concentration in relation to bacteriological media; though this section is otherwise sound and praiseworthy in itself, it may be doubted whether it is methodologically a good introduction to bacteriology. A section, also excellent, on the use and care of the microscope precedes the bacteriology proper, which begins only on page 70; in between are sandwiched recipes for the preparation of media, some of which are specialized and not referred to again until a later part of the book.

Any introduction to bacteriological technique can be criticized, but it is open to serious doubt whether the arrangement here adopted is a good one either educationally or for the purposes of maintaining the student's interest and critical powers. The easy and instructive *Azotobacter* test for soil fertility has been omitted, and the reader of this book would hardly suspect that there was any real relation between general agriculture and bacteriology. The treatments of dairy bacteriology, and of the study of pathogenic organisms are satisfactory within their respective scopes.

The book being so good in parts, it is unfortunate that the higher standard has been not evenly maintained. The reasons for some operations are given, but there is a good deal to suggest that bacteriology must present itself to the student largely as a set of intricate and unrelated operations that must be learned by rote. Philosophy and agriculture should go well together, but the marriage as set forth here is not a happy one.

Recent Advances in the Study of Plant Viruses. By Kenneth M. Smith. Pp. xii+423. (London: J. & A. Churchill. 1933. Price 15s.)

The first plant disease of the virus type to be recognized was the so-called Mosaic of tobacco, and this occurred more than forty years ago. At that time, and for a considerable period afterwards, no very great amount of attention was devoted to such diseases, but during the past two decades or so, virus diseases have been the subject of an ever-increasing amount of study; and the mass of literature published concerning them has become enormous. Until the appearance of the volume under review, however, no author had been bold

NOTICES OF BOOKS

enough to write a book wholly devoted to the subject, and Dr. Kenneth Smith is to be congratulated not only on his courage in undertaking a heavy and responsible task but on the successful way in which he has accomplished it. A book of this kind has for long been a pressing requirement, and plant pathologists and others will welcome its appearance and find it of the utmost value. The title is perhaps not quite comprehensive enough, for, after dealing in the first eleven chapters with viruses themselves, their relation to insects, their transmission and physiology as well as with certain other features concerning them, the last three chapters are devoted to a large number of specific plant diseases caused by viruses, these being described under the various hosts arranged according to their Natural Orders. Thus effects, as well as causes, are substantially covered by the book.

The author very rightly stresses the importance of discriminating between the name applied to a virus disease and the name of the virus that causes it, for looseness in this respect in much of the spate of literature has led to considerable confusion. Nevertheless, even Homer nodded when Paracrinkle (p. 308), Interveinal Mosaic (p. 311) and certain other potato diseases were put in the category of viruses. Again, the author does not confine himself entirely to plant viruses but also has something to say about animal viruses. Whilst a study of the latter may, in a general way, be helpful in understanding the nature and properties of plant viruses, yet care must be taken not to push apparent analogies in the realms of animal and vegetable pathology too far. Those who are acquainted with the older literature concerning potato Blight will remember the extremely poor show made by medical men in explaining its true nature and cause, and will recall how they were roundly beaten by their parson contemporaries!

It is interesting to note that the author considers (p. 11) that too much attention has been devoted in the past to the symptomatology of plant virus diseases, but there are some persons who would perhaps demur to this view, and would rather be inclined to maintain that if those who had concerned themselves so largely with symptomatology had been better botanists—had possessed, for instance, the training and acumen of the older generations of botanical systematists, to say nothing of a competent familiarity with vegetable anatomy and histology—then the symptomatology of virus diseases would have been in a much less chaotic state than it seems in many cases to be to-day. Clearly-defined symptoms for virus disease diagnosis will always remain important, even when strict aetiological differentiation is much less difficult and time-absorbing than it is at present. It is doubtful whether any single plant virus has yet been isolated in a perfectly pure or unmixed state; and this, naturally, makes the problem of giving specific names to plant viruses extremely difficult. It has already happened more than once that what had for long been considered a single virus has turned out to be two or more. When viruses can be obtained in the pure state, however, then surely symptomatology will call for even more attention than it has received in the past; for, by studying artificially-inoculated hosts, under given sets of conditions as to age and specific environmental factors, it should be possible to register once for all the resulting characteristic symptom-responses.

Following each chapter in the book there is a judiciously selected and ample list of references to the matter dealt with therein. These lists constitute a very important feature of the book, and will render it invaluable to the research worker. There are nearly seventy illustrations (one coloured), all of which are relevant and well reproduced. A useful glossary of the technical terms used is appended, and there is an author as well as a general index. Typographical errors appear to be very few, but "undulated" (p. 373) should presumably be "undiluted." There can be no doubt that, as is suggested in the

NOTICES OF BOOKS

Foreword by Mr. F. T. Brooks, the book will be of great interest to all workers on plant diseases; that it constitutes a valuable guide to plant pathologists and to those concerned with the maintenance of healthy crops; and that it will provide a stimulus to further investigation. The publishers may be congratulated on the inclusion of it in their "Recent Advances" series, to which it forms a signal addition.

Small-Fruit Culture. By J. S. Shoemaker, B.S.A., M.S., Ph.D. Pp. xv+434, and 52 figs. (Philadelphia: P. Blakiston's Son & Co., Inc., 1012, Walnut Street. 1934. Price \$3.50.)

In the United States of America nearly a million acres are devoted to the cultivation of "small" fruits, viz., grapes, strawberries, bramble fruits, currants, gooseberries, blueberries and cranberries. Dr. Sheldon Shoemaker's new book gives a very thorough survey of this important industry, dealing with its geographical distribution, the varieties grown in each district, and the cultural methods adopted. Costs of production, yields, and methods of marketing are also summarized, and much information resulting from research work is included, and the original papers cited in a long bibliographical list.

To the British reader this work has a threefold value: (1) it is an extremely useful reference book with its encyclopædic fund of facts concerning small fruit culture in the United States; (2) it is a valuable source of information concerning the culture of certain fruits with which the Americans are particularly successful, such as the bramble fruits (raspberries, loganberries, dewberries and blackberries); and (3) the reader is compelled, by comparing American methods with those adopted in this country, to meditate upon our own position. An example of such a thought-provoking statement is found in the section on strawberries: "Quite often fruiting the commercial planting once only is best, . . . but fruiting the beds two years is undoubtedly the commonest practice in most sections. Attempting to harvest three crops is a precarious proposition, and is seldom advisable commercially."

This book can be recommended to all students of fruit growing, as well as to growers inquisitive of methods adopted in foreign countries.

The Rose Encyclopædia. By T. W. Henslow, M.A. New and revised edition, Ed. by W. Brett, F.R.H.S. Pp. 320, & 48 figs. (London: C. Arthur Pearson Ltd. 1934. Price 5s.)

This book has long provided an excellent guide for the amateur rose grower, and the new edition, which has been brought up to date by the editor of "Home Gardening," provides a reliable source of information on the subject of the rose and its cultivation in gardens. This work, despite its title, has never catered for the professional rose grower or for the commercial flower grower, and in the present edition nothing is said on the important subjects of rose growing under glass for market or nursery practice in establishments where the production of rose plants for sale is the primary consideration. The book deals with every conceivable aspect of the subject of rose growing in gardens, and is not only good value for money, but remains a useful and sound source of information for the amateur gardener, and one that can be recommended. The new edition is decidedly improved by the inclusion of a large number of photographic illustrations relating to the various operations described in the text. There are also some useful designs for small rose gardens and several excellent coloured plates. Approximately 100 pages are devoted to a "dictionary of roses" in cultivation to-day. The descriptions of varieties in this dictionary have been compiled from materials supplied by raisers and introducers and so, perhaps, lack the usefulness of critical judgment.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 11 February, 1935

NOTES FOR THE MONTH

Tuberculosis (Attested Herds) Scheme for England and Wales

ON January 12 the Ministry issued a document describing the " Arrangements " in England and Wales made by the Ministry under Section 9 of the Milk Act, 1934, and approved by the Treasury, for promoting the establishment of cattle herds officially certified to be free from tuberculosis.

The document consists of two parts—(i) an Explanatory Memorandum on the Scheme, and (ii) the Rules required to be observed by the owners of herds so certified.

The Scheme states that any owner of cattle who has taken steps to eradicate the disease from his herd, and who is a " Registered Producer " under the Milk Marketing Scheme is entitled to make an application to the Ministry for an official test of his herd, provided that no reactors were found in the herd on the occasion of the last two tests made on the owner's behalf, if the latter were carried out with an interval of not less than six and not more than twelve months between the tests, and if the last of these two tests was carried out not more than twelve months before the date of application. If the owner satisfies the Ministry that the management of the herd and the conditions in which it is kept are suitable and gives a written undertaking to observe the Rules applicable to an attested herd, an official tuberculin test of all animals in the herd will be made by the Ministry free of charge, and if no reactors are then found the Ministry will issue a Certificate of Attestation in respect of the herd, which will thereupon be added to a Register of Attested Herds to be kept and

NOTES FOR THE MONTH

published by the Ministry. This scheme, which will come into operation on February 1, 1935, is necessarily a voluntary one.

One of the advantages of attestation is that the owner will become entitled to a bonus of 1d. per gallon for all milk from the attested herd that is sold under the provisions of the Marketing Scheme of the Milk Marketing Board during the period for which the Certificate of Attestation is valid. This 1d. per gallon is additional to any advantages which the owner may become entitled to under the Accredited Producers Scheme of the Milk Marketing Board now under consideration if and when that scheme comes into operation.

Owners who wish to apply to the Ministry for a Certificate of Attestation under this Scheme should communicate direct with the Secretary, Ministry of Agriculture and Fisheries, Whitehall Place, London, S.W.1.

Farm Water Supplies and Manurings

WEATHER conditions are usually the first topic of conversation among farmers, although in this connexion one feels that the working of the various marketing schemes is now a close competitor. When one reads in a newspaper that 1934 was the wettest year since 1929 one begins to lose faith in statistics and to question the value of averages. Although the abundant rainfall of December—as much as 12 in. in some of the southern counties—may have obliterated in the minds of townsmen and statisticians, the memory of last summer's drought, shortage of water is still the most vivid recollection to the man who makes his living from the land. It was only during the last month of 1934 that moisture, in many parts, really penetrated the pastures, and even since then we have heard of such anomalies as the "petering out" of wells that had carried on through the autumn, and the need to fetch water from the recently replenished dew ponds on the hill tops.

Two dry years in succession have revealed many weaknesses in our present system of water supplies. Much more water than formerly is now being used for various purposes, both in town and country, and more of it finds its way rapidly to the rivers and the sea. It is, therefore, gratifying to know that a committee is being appointed to undertake a survey of our inland water resources.

NOTES FOR THE MONTH

Meanwhile the continuous wet, mild spell up to the end of the first week in January was welcome to the farmer. Even if we have a third successive dry year the chances are already favourable for a bigger hay crop than was garnered in 1934, and for a much longer period than usual the pastures have produced valuable keep of the short, fresh, green kind most relished by stock. The only danger is that continuous, hard grazing may reduce the vitality of the herbage. To provide against this a dressing of soluble quick-acting fertilizers is advisable. Phosphates, and where necessary potash (as on light land), may well be applied at once, and followed in mid-February by 1 cwt. per acre of a nitrogenous manure. "Spelling" or resting, afterwards, is desirable to give the plants a chance to strengthen their root-hold and enable them the better to withstand such dry, cold periods as almost invariably occur in late spring, at least in the south.

In early January ordinary field work was practically at a standstill, but, as was remarked by Cato, the Roman Consul, in the second century B.C.: "When the weather is rainy, tell him what work could have been done in spite of the rain. . . . Wash storage jars, clean out buildings, shift grain, pile manure, clean the seed." For "storage jars" we might now, perhaps, read "ponds" and consider ways and means generally of diverting present surplus water to future possible use.

Land Settlement Association

THIS Association, which has been formed for the purpose of instituting and carrying out an experimental scheme for the provision of small holdings for unemployed persons, with financial assistance from the Government, has now been registered under the Industrial and Provident Societies Acts, and offices have been taken at Broadway Buildings, S.W.1.

An Executive Officer (Mr. L. D. Gammans) has been appointed and a Warden has also been appointed for the estate (at Potton in Bedfordshire) that has been presented to the Association by Mr. P. M. Stewart, who has since resigned his membership of the Association on being appointed Commissioner for the Special Areas of England and Wales.

The Treasury has paid £5,000 as a first instalment of the grant from the Development Fund, and the Carnegie

NOTES FOR THE MONTH

Trustees have decided to make a grant of £10,000 to the Association.

A general plan of development of the estate and a scheme of settlement for the first 20 settlers have also been drawn up.

Arrangements have been made with the Commissioner for the Special Areas to co-operate with him in providing 5-acre holdings, outside the Special Areas, for men to be transferred from those areas.

Varieties of Cereals for Spring Sowing

At this time of the year provident farmers await with interest the issue of seedsmen's current catalogues, and on their receipt carefully compare the rival claims of the many varieties of which seed is offered. With the object of helping them in their choice of cereal varieties the National Institute of Agricultural Botany continuously carries out comparative variety trials on a field scale in the Midlands, East and South of England, and issues a leaflet, which is revised whenever necessary, setting out the practical results of its investigations. This leaflet, just revised, is obtainable free of charge through all Agricultural Organizers or direct from the National Institute of Agricultural Botany, Cambridge.

While not encouraging the growing of spring wheat, since it is seldom a profitable crop, the Institute's experience shows that if this practice is followed, the most satisfactory varieties are Little Joss if drilled by the middle of February, Red Marvel or A.1 for the first half of March, and April Bearded thereafter until the middle of April.

Oats recommended are Victory, Star, Golden Rain and Golden Rain II—the last two essentially for home consumption, for although very heavy yielders their grain is small and its yellow colour does not find general favour among purchasers. Marvellous is recommended for sowing on good soils, as is a new Cambridge Plant Breeding Institute production, Resistance, which, though primarily a winter variety, also produces high yields on strong straw when spring sown. Another new recommendation for normal sowing is the Eagle, which yields more heavily than Victory and has good straw, but its grain is small.

In barleys the Institute restricts its recommendations to the well-known varieties Plumage-Archer 1924 and Spratt-

NOTES FOR THE MONTH

Archer. Where late sowings cannot be avoided Svalöf Victory or the Danish Kenia and Maja barleys deserve trial.

Whichever variety is chosen, early sowing almost always pays. British-grown seed gives just as good results as imported seed, if the standard of purity and germination are the same.

A further leaflet dealing in general terms with choice of seed, in which such points as purity, germination, variety, origin and price are dealt with, has recently been compiled by the Institute, and those who obtain it (*gratis*), either from County Organizers or direct from the Institute, should find it of considerable use when deciding what seed to buy.

Starling Roosts

ON St. Paul's Cathedral, the National Gallery, St. Martin's-in-the-Fields, the Charing Cross and many other places in London, vast numbers of starlings foregather every day at dusk during the winter months. Most dwellers in the country and many in the cities must at some time or other have seen the great gatherings of starlings that perform such wonderful flight evolutions in autumn and winter, and that so frequently congregate at a communal roosting place. The starling certainly does much useful work on pastures, owing to the enormous quantities of insects that it destroys, but in some localities it may be exceedingly injurious. There can no longer be any doubt as to the economic position of the starling, which has been forced to change its feeding habits and increasingly supplement its diet by taking cereals and fruit. The concerted flights are fascinating to watch, but the places where the birds roost are a sight of quite another kind to behold. One of the intensely-occupied roosts many years ago was on a small island (Cramond Is.) in the Firth of Forth, and the coniferous trees in which the birds passed the night were heavily weighted with their excreta and severely injured.

Mr. B. J. Marples, of the Victoria University of Manchester, has made a survey of the winter roosts of starlings in Great Britain, the period concerned being October, 1932, to April, 1933. The investigation revealed the presence of 224 roosts in England, 39 in Scotland and 22 in Wales. With very few exceptions the roosts are in situations below the 600-foot level, but there is one near Bradford at a height of 1,200 ft.—the highest recorded. It is remarked

NOTES FOR THE MONTH

that starlings flying to roost "have a curious tendency to avoid passing over hills."

The greatest density of roosts is in counties south of a line joining the Wash and the Severn, and in the north-western midlands. "The longest authenticated flight line from feeding grounds to roost is 30 miles." This was in South Devon. A good many roosts have been in use for more than ten years, one for 135 years and another for about 180 years! One roost is on St. Paul's Cathedral, and is estimated at 7,000 birds. Some of the country roosts are occupied by many thousands of birds, and Mr. Marples observes that "When several hundred thousand starlings roost in a small wood every night for five or six months, their droppings accumulate and produce various effects." Mr. Marples's paper is included in the November, 1934, issue of *The Journal of Animal Ecology*.

Power Farming Course at Harper Adams Agricultural College

THE following note has been communicated by Dr. Charles Crowther, Principal of Harper Adams Agricultural College, Newport, Shropshire:—

The active interest now displayed in the application of tractors and other modern power appliances to farming was again effectively demonstrated by the success of the Third Power Farming Course held at the Harper Adams Agricultural College, from January 7 to 12. Some thirty visitors attended the full course and took advantage of the residential accommodation provided at the College, while a number of part-time visitors also enrolled.

The visitors were drawn from all parts of the country, and were definitely agricultural, consisting mainly of practical farmers, members of county agricultural advisory staffs and members of the technical staffs of manufacturing concerns interested in agriculture.

The lectures were very keenly followed, and full advantage was taken of the opportunities for comparison of experiences and opinions on the various problems connected with power farming, much of the time between sessions being employed in this way. It is interesting to record the general opinion that "Power Farming" implies the application of all forms of power in agriculture to increase production, eliminate wastage of labour and to maintain land in a high state of fertility.

NOTES FOR THE MONTH

In addition to the lectures on power farming a number of evening lectures on problems of general agricultural interest were introduced and were very much appreciated by those who attended the course.

The field demonstrations were designed to amplify the lectures and about a dozen tractors were engaged in ploughing, subsoiling, sugar-beet harvesting, grass-land harrowing, etc. Other items of interest included a working exhibit of electrical motors, barn machinery and poultry appliances.

Allotments

THE Treasury has sanctioned a grant from the Development Fund for the season 1934-35 to the Society of Friends' Allotments Committee in aid of their work of supplying seeds, fertilizers, etc., to unemployed men for whom allotments have been provided. The grant is on the basis of £ for £ raised from private sources up to £8,000, and £1 for £2 up to an additional £4,000, so that the maximum grant payable will be £12,000 against a sum of £16,000 to be raised by the Society. It is provided that the men shall contribute half the cost of supplies, including administration expenses, the average cost per head being estimated, in the Committee's application, at the same figure as in 1933-34, viz., 8s. 2d., and the maximum number of men to be assisted at 150,000, against 120,000 in that year. The Society is authorized to spend £7,500 of their accumulated balance on their Land Settlement Schemes now to be described as "group holdings."

Third Report of the Agricultural Machinery Testing Committee

THE Third Report of the Agricultural Machinery Testing Committee has just been issued,* and describes the work of the Committee during the period April 1, 1932, to March 31, 1934. In addition to describing the tests undertaken during that period, the report contains a detailed description of the work at the Research Institutes where the actual tests are carried out, i.e., the Agricultural Engineering Research Institute, Oxford, and the National Institute for Research in Dairying, Reading, as well as a summary of the con-

* Copies may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 3d., post free 3½d.

NOTES FOR THE MONTH

ditions under which agricultural machinery is tested in foreign countries.

The number of tests has been small, but the experience gained from them has been of the utmost value, and the Committee anticipate that greater advantage will be taken of the scheme in the future as a result of the marketing organization now taking place in many branches of the agricultural industry. The demand for standardized production must lead to the development in many directions of mechanical methods of securing standardization, and the Agricultural Machinery Testing Scheme, in enabling the manufacturer to obtain an unbiassed opinion regarding the efficacy of the machine, and the farmer guidance as to its value, would appear to give precisely the facilities which this situation would demand.

Destruction of Weeds

CONVICTIONS have been obtained in two cases where authority was given to the Agricultural Committees of Kent and Lindsey to lay an information, on behalf of the Minister, against certain occupiers of lands for failure to comply with notices to destroy weeds. Fines of five guineas were imposed, and, in the Kent case, an additional three guineas costs.

The returns of the number of weeds cases from Agricultural Committees in England and Wales, during the year ended September 30, 1934, show that 6,961 cases were dealt with, as compared with 7,078 last year, and 6,823 in 1932.

Basis for Redemption of Tithe Rentcharge

THE Minister of Agriculture and Fisheries announces that, for the purpose of the redemption of tithe rentcharge, for which application is made after January 4, 1935, until further notice, the compensation for redemption will be 32 times the net amount of the tithe rentcharge after the deductions prescribed by the Tithe Acts, 1918 to 1925, have been made.

THE ARTIFICIAL DRYING OF YOUNG GRASS

H. E. WOODMAN, M.A., Ph.D., D.Sc.,
School of Agriculture, Cambridge University.

DURING the season of 1925, the writer and his co-workers, having become aware of a general lack of information concerning the composition and feeding value of grass as consumed by grazing animals, began a series of investigations designed to lead to a complete elucidation of the nutritive characteristics of pasture grass. As a result of these investigations, and the numerous other researches of a similar nature to which they gave rise in various parts of the world, it may be claimed that no other farm food has received such detailed attention at the hands of the nutritional worker as has pasture grass. It is satisfactory to record that the fundamental findings of the Cambridge investigations have received ample and widespread confirmation.

The purpose of this article is to describe the progress that has been made with the proposal for conserving young grass by the method of artificial drying for use as a winter concentrate. Before dealing with this, however, it will perhaps be advisable to consider very briefly the experimental results that led to the formulation of the proposal.

The first outstanding finding of the earlier Cambridge work was the discovery that young, leafy pasturage is exceedingly rich in protein and has a much higher digestibility and feeding value than had hitherto been suspected. The dry matter of such herbage has the characteristics of a protein concentrate like bean meal, containing 70 per cent. or more of starch equivalent and including about 20 per cent. of digestible protein. Further, these attributes were shown to be, to a very large extent, independent of the type of herbage, or the presence of much or little wild white clover. A ration of young, leafy grass containing 30 lb. of dry matter (i.e., the amount that a dairy cow is able to consume daily) supplies 21 lb. of starch equivalent, including 6 lb. of digestible protein. This represents sufficient starch equivalent for 6 gallons of milk and enough digestible protein for 9 gallons. Clearly such herbage is not a balanced diet for milk production, because it is too rich in protein in relation to its content of starch equivalent.

ARTIFICIAL DRYING OF YOUNG GRASS

When the grass in a field is cut regularly at intervals of a week to a fortnight, the high spring value in respect of starch equivalent and digestible protein is maintained substantially throughout the season, provided summer rainfall is adequate to keep the grasses growing actively. Such a severe system of cutting, however, carries with it certain disadvantages, since pastures so treated are apt to suffer excessively in periods of dry weather, and, even under the most advantageous conditions, give a much smaller yield of nutrient food per acre than when they are permitted a three weeks' or a month's interval of unchecked growth between successive cuttings.

As far as digestibility and nutritive value (expressed as starch equivalent) are concerned, there is little to distinguish between grass that is cut at weekly, fortnightly or 3-weekly intervals. With the lengthening of the interval, however, the nutritive ratio of the herbage tends to widen and the grass to become more adapted to form the sole diet of grazing animals. On the basis of dry matter, the average *crude* protein content of grass cut at weekly intervals is about 25 per cent., that of fortnightly-mown grass about 23.5 per cent., and that of grass cut every three weeks about 21 per cent.

Under a system of regular monthly cuts, it was found that during the fore-flush period, provided the pasture had been left uniformly cut down at the end of the previous season, there is little difference in digestible protein and starch equivalent content between the grass so obtained and grass that is cut at more frequent intervals. The dry matter of such monthly-mown herbage contains nearly 20 per cent. of digestible protein and more than 70 per cent. of starch equivalent, and is therefore to be regarded as a protein-concentrated food. From mid-May onwards, however, monthly-mown grass becomes less rich in protein, 100 lb. of its dry matter containing 66½ lb. of starch equivalent, including 13 lb. of digestible protein. A ration of such grass containing 30 lb. of dry matter supplies, therefore, 20 lb. of starch equivalent, including 3.9 lb. of digestible protein. Since the requirements of a 5-gallon cow are 20 lb. of starch equivalent (allowing 1 lb. for the energy expended in grazing) and 3.7 lb. of digestible protein, it follows that such herbage contains just enough starch equivalent and digestible protein to meet the requirements of a 5-gallon cow. Moreover, such a ration (30 lb. of dry matter) would supply

ARTIFICIAL DRYING OF YOUNG GRASS

about 6 oz. of lime and 5 oz. of phosphoric acid, the needs of a 5-gallon cow for these constituents being about 4 and 4.1 oz. respectively. Clearly a ration of 34 lb. of artificially-dried, monthly-mown grass is able to furnish all the nutrient matter necessary to the sustenance of a 5-gallon cow.

When the interval between successive cuts is lengthened to five weeks, the fore-flush grass again displays the characteristics of a protein-concentrated food, whilst during the flush period, the herbage contains sufficient starch equivalent for about 5 gallons of milk, but only enough digestible protein for 4 gallons. Following the flush growth, however, the herbage approximates in nutritive value to that obtained by cutting at monthly intervals and becomes capable of supplying the whole of the requirements of a 5-gallon cow. In the light of these findings, the writer recommends that when grass is being cut for the purpose of conservation, a system of monthly cuts should be adopted up to the end of the flush period of growth, whereas, during the slow-growing summer period, the interval between successive cuts should be lengthened to five or even six weeks. It may be noted that under a system of monthly cuts, the herbage during the flush period may attain a height of 7-10 inches, with rye grass stems up to 12 inches, while some of the grasses may reach the early stage of flowering.

Conservation of the Produce of Pastures.—With the recognition of the protein-concentrated and highly digestible nature of young, leafy grass, it was but natural that the writer and his co-workers should put forward suggestions for the conservation of the surplus produce of pastures for use during winter as a concentrated food. Writing as long ago as 1926, the writer ventured to make the following prediction: "A future generation may witness the utilization of large areas of grass land for the sole purpose of production of protein concentrate. Pastures, having the appearance of vast lawns, may be cut over regularly and frequently throughout the growing season, the nutritious, protein-rich produce being preserved for feeding to animals in winter confinement, along with balancing home-grown feeding stuffs like meadow hay, cereals and roots. The mode of preservation may either be artificial drying, followed by pressing into cakes or grinding to the roughly

ARTIFICIAL DRYING OF YOUNG GRASS

powdered form, or it may consist in ensiling the freshly-cut grass." It was pointed out that such a side-line in grass land husbandry would provide a winter concentrate rich not only in digestible nutrients and minerals, but also in respect of vitamin potency and in the pigments necessary for maintaining the colour in milk, butter and eggs during the non-grazing winter season. Indeed, pasture grass conservation implied a twelve, instead of a six months' pasture season.

It cannot be claimed that this prediction has been fulfilled as yet, but much useful progress has been made. The first attempt to explore the possibilities of this new system of conservation was made at the School of Agriculture in Cambridge, when a small quantity of compressed cakes, made from kiln-dried lawn clippings, was produced. This was followed by a large-scale trial under the auspices of Imperial Chemical Industries, Ltd., in collaboration with the School of Agriculture. During the 1927 season, the former undertook the systematic cutting of some acres of grass land in the vicinity of their factory at Billingham. The cutting was so regulated that the herbage was always taken in its young, leafy condition. Soon after cutting, the grass was dried down in steam-heated troughs, and later the dried product was compressed into cakes by hydraulic presses. These dried grass cakes measured 6 inches by 5 inches by 1 inch, and were of such a density that 40 cubic feet of the compressed material weighed 1 ton. They had kept the green colour of the fresh grass and had a pleasant fragrant smell. When moistened with water, they swelled up considerably and disintegrated. Sheep, bullocks and dairy cows ate them eagerly, both in their dry and soaked conditions. It is of interest to record that samples of these dried grass cakes have been kept for more than 7 years in an open box under laboratory conditions with very little deterioration in colour and smell. They still contain about 8 per cent. of moisture and 25 per cent. of protein.

Critical feeding tests with these dried grass cakes were made at Cambridge, and two main conclusions were drawn: (1) The process of drying at 100°C. does not impair the high nutritive properties of the fresh grass; (2) The dried grass cakes can successfully replace oil cakes in the winter rations of dairy cows and fattening cattle. In feeding trials at the University Farm, store cattle receiving 5-7 lb. of the dried grass in their rations instead of the usual concentrate mixture averaged a steady 2 lb. per day live-weight increase

ARTIFICIAL DRYING OF YOUNG GRASS

during the first two months of fattening, and about $1\frac{1}{2}$ lb. per day for the last month. They displayed a beautiful "bloom" at the end of the experiment, and three local butchers, each of whom purchased two of the animals, would not believe that these cattle had not been receiving a generous allowance of cake, that is, cake in the accepted sense of the word. The quality of the beef was excellent, and one of the slaughtermen, inquiring as to the feeding of the cattle, remarked that from the appearance of the carcass, he would have supposed it was the best "grass" beef. Equally successful results were obtained in the use of the dried grass cakes for dairy cows, when the whole of the normal cake allowance and minerals was replaced, at the rate of $3\frac{1}{2}$ lb. per gallon, by a mixture of three parts of dried grass cake and one part of crushed oats, the latter being included to balance the digestible protein in the grass cake.

Further experiments were next conducted by the writer and his colleagues on the product obtained by drying young grass in a kiln that had been erected for the purpose of drying seed after electrical treatment. The material was dried in 4-inch layers on a floor the temperature of which rose to about 115°C . The temperature of the grass, however, did not rise beyond 50°C . so long as active evaporation was taking place. Only in the final stages, when the grass was almost dry, did its temperature rise beyond 90°C . At intervals of 30 minutes the grass was turned by means of forks, and after 3 hours of drying, it was removed from the drying chamber. At this stage, its moisture content was 2.4 per cent. It had retained the green colour of the fresh grass and had quite a pleasant aroma. No attempt was made to press the large bulk of dried grass made by this procedure into cakes. It was simply stored as a compact heap in a dry farm building. It may be observed that pressing into cakes or briquettes is to be recommended only when prolonged storage or long transport is envisaged. Storage trials with baled dried grass have also been quite successful. At a later date, digestion trials of the dried product were carried out, the results again demonstrating that such low-temperature drying of young grass does not in any way depress the high digestibility and feeding value of the fresh herbage.

An experiment similar to the foregoing was carried out at a later date at Wye Agricultural College. Here some-

ARTIFICIAL DRYING OF YOUNG GRASS

what older grass was dried down in an oast. In subsequent sheep-feeding trials, it was shown that the dried grass was equal in feeding value, lb. for lb., to a mixture of oats and cotton-seed meal.

Since the initiation of the Cambridge inquiry, experiments have been carried out in many parts of the world, notably in this country, Sweden, Denmark, Germany and the United States, with the object of solving the problem of grass-drying from the economic point of view. The cutting and collection of young grass no longer presents any serious difficulties. When it is 5-8 inches in height, it may be cut with an ordinary farm mower, the swaths being gathered into heaps by a horse-rake and filled into carts with a three-pronged fork. For shorter grass, however, a re-design of sweeps, rakes, wagon-loaders, etc., is necessary, and special implements such as the Wilder combination of mower, elevator and trailer are examples of the efforts that are being made to overcome this difficulty.

The series of researches carried out in recent years at the Jealotts Hill Agricultural Research Station, more especially on the influence of quick drying at high temperatures on the digestibility and nutritive value of young grass, merits particular notice. This work has shown that a band drier operating with furnace gases at 200°C. gives a product displaying no significant loss of digestibility as compared with the fresh grass from which it was made. Indeed, it has demonstrated further that the temperature of the inlet gases may be as high as 700°C., under which conditions drying is extremely rapid, without causing any serious impairment of quality and feeding value, *provided the drier is operated in such a manner that the material is removed from contact with the hot gases as soon as it is dry.* Another important result of the Jealotts Hill researches is the discovery that under satisfactory conditions of drying, most of the carotene of the fresh grass is retained in the dried product, and that the use of the latter in the winter rations of dairy cows results in the production of a yellow butter comparable with that produced when the cows are at grass in summer. The dried grass has been shown to have a high vitamin A potency. Thus have some of the early predictions of the writer been fulfilled.

It is interesting to record that the foregoing findings have been amply confirmed by very recent investigations in the United States. Space forbids reference to more than one of these trials, in which immature grass cuttings, dried in a

ARTIFICIAL DRYING OF YOUNG GRASS

rotary-type, high-temperature dehydrator, replaced a 20 per cent. protein grain mixture in a 20 weeks' feeding trial with dairy cows. The milk, fat and solids-not-fat yields were essentially identical in each instance, and, on the basis of total consumption of digestible nutrients, the dried grass ration proved to be as good as that containing grain.

Dried Grass versus Lucerne Meal.—The recent work of the writer and his colleagues has shown that the main distinction in nutritive properties between lucerne and grass is the readiness with which the young lucerne plant produces fibre, and the early stage of growth at which the fibre begins to display signs of lignification and diminished digestibility. Lucerne, both in bud and flower, is very distinctly inferior in digestibility and feeding value to pasture herbage submitted to systems of cutting at intervals of from 1 to 5 weeks. On account of its high content of indigestible fibre and its relatively low content of digestible organic matter and starch equivalent, the dry matter of lucerne, in bud or in flower, is comparable in nutritive properties to a superior coarse fodder rather than to the pasture cuts, the dry matter of which has the nature of a concentrate. In order to secure a meal of concentrate character from lucerne, it is necessary to cut and dry the crop before it has arrived at the bud stage, although such treatment, if carried out continuously, may react very disadvantageously on the vigour of the crop and the length of the life of the stand. A lucerne meal obtained by this means may be regarded as a concentrate of rather moderate starch equivalent, but furnishing a generous supply of digestible protein. In the latter respect, pre-budding lucerne meal is comparable with dried young grass at its best, but it is inferior as a source of starch equivalent. Lucerne *leaf* meal, made from the foliage of the flowering crop, is very similar in feeding value to the pre-budding lucerne meal, but the Cambridge work emphasizes the superiority, in respect of digestibility and starch equivalent, of dried young grass over all the forms of lucerne meal and leaf meal.

The yield, in terms of lb. of dry matter per acre, from permanent pasture submitted to intensive fertilizing and cutting at monthly intervals, has been found to be, under Cambridge conditions, of the same order as that from the lucerne crop. In one season of favourable rainfall, for example, as much as 3·8 tons per acre of air-dry material

ARTIFICIAL DRYING OF YOUNG GRASS

(assuming 10 per cent. of moisture) was obtained. The yield, however, may be much lower in a hot, droughty season, and for this reason, grass-drying on an industrial scale should only be attempted in those parts of the country where rainfall is usually sufficient to keep herbage growing actively throughout the whole season. The possibilities are exemplified by a recent grass-cutting trial at the Hannah Research Institute, Ayr, where, during the 1932 season, a yield of over $5\frac{1}{2}$ tons per acre of air-dry grass (10 per cent. of moisture) was reached by cutting at 3-weekly intervals.

The use of nitrogenous fertilizers like sulphate of ammonia on grass land areas set aside for cutting and conservation provides a method of converting inorganic nitrogen into protein of high nutritive value. Such treatment leads also to an enhancement of the carotene content and vitamin A potency of the dried grass product. The magnitude of the stimulation of growth obtained by the use of complete mineral manures together with artificial nitrogenous fertilizers is naturally related to the type of grass land selected. In 1930, a good grass year, the average increase in the yield of herbage at a large number of centres distributed throughout the United Kingdom from the application of chalk, superphosphate and potash, together with periodic small dressings of sulphate of ammonia, was 45 per cent. The individual improvements, however, ranged from as low as 3 per cent. on good Rutland fattening pasture to the enormous figure of 425 per cent. on the "natural" herbage of the Wiltshire Downs. In nearly every case the increase was accompanied by an improvement in quality as measured by the protein, lime and phosphoric acid content.

Economics of Grass-drying.—It may fairly be claimed that the high nutritive properties of artificially-dried young grass have been demonstrated beyond all shadow of doubt. Further, the engineering problems connected with large-scale drying are well on the way towards solution. Driers of the tray, drum, pneumatic conveyor and band types have been experimented with, the names of several of these types of drying appliances having become quite well known during recent years, both at home and abroad. Success is also attending the efforts that are being made to design small-scale plants for use on individual farms.

If the position in respect of the nutritional and engineering aspects is satisfactory, what of the economic aspect?

ARTIFICIAL DRYING OF YOUNG GRASS

When the writer first put forward the proposal for conserving young grass for use as a winter concentrate, the prices of the common concentrates were extraordinarily high. Linseed cake, for example, was £13 10s. per ton, and in such circumstances the production of dried grass offered attractive possibilities. Since that time, however, the cost of feeding stuffs has come down considerably—with some, indeed, almost below the economic level. For this reason, it is perhaps not possible to write quite so confidently about the future of the grass-drying proposals.

Without attempting to enter too fully into this aspect of the question, it may be stated that if some doubt may possibly be entertained under present conditions respecting the economic prospects of large-scale factory drying, the position is much more favourable for small-scale drying on individual farms. A farmer could use a small-scale drier at certain times with his ordinary permanent labour. Such grass as could be dried would be surplus grass that would otherwise be wasted. Further, by this means, the flush growth of grass on the farm could be controlled and prevented from running off into a fibrous and much less digestible condition. At the present time, efforts should mainly be directed towards meeting the requirements of individual farmers. An improvement in the price of feeding stuffs would quickly give encouragement to such concerns as might desire to exploit the process on a factory scale. If such industrial concerns find the manufacture of lucerne meal worth while, it is clear from the considerations of the preceding section that the factory production of dried grass is well worth attempting.

The method offers a large degree of independence of imported feeding stuffs. Indeed, a system of animal feeding could be elaborated on the basis of such grass land management—frequent cutting for the production of protein concentrate, less severe cutting for securing a “balanced” concentrate, and hay-making for the necessary coarse fodder. Must we wait until times of food scarcity, such as war-time, before giving these new ideas a full trial?

COLORADO BEETLE AT TILBURY—II

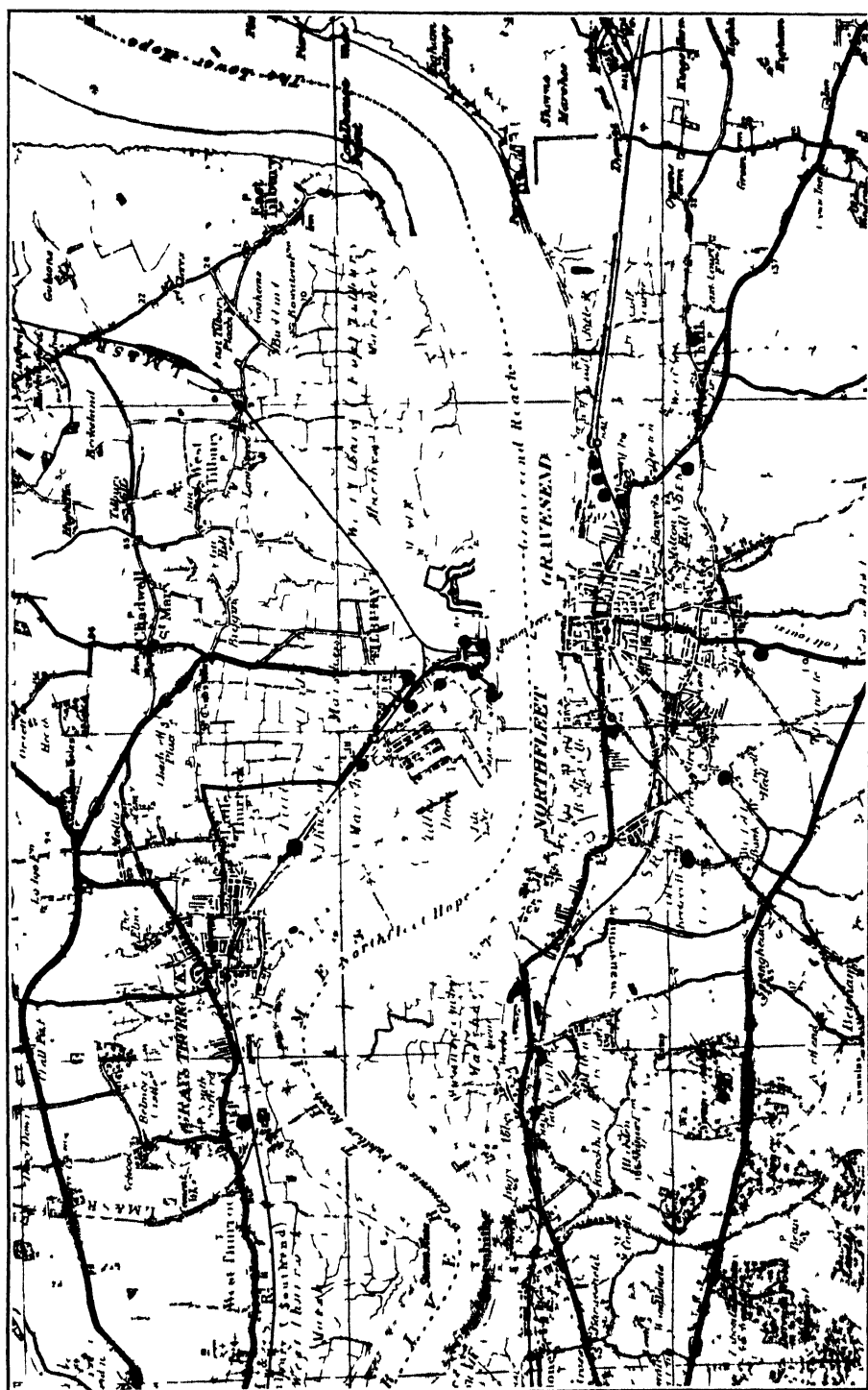
J. C. F. FRYER, O.B.E., M.A.,
*Director, Ministry of Agriculture Plant Pathological
Laboratory, Harpenden.*

IN the issue of this JOURNAL for January, 1934, there appeared a description of the discovery of the Colorado Beetle at Tilbury in August, 1933, and of the measures that were taken to deal with it during the autumn of that year. Some account of the subsequent developments may now be given.

Discoveries in the Winter of 1933-34.—In the previous article, it was noted that beetles had been found, during October and November, 1933, by an examination of the soil of plots that had carried potatoes during the summer. These beetles were detected by the careful examination of soil samples, and, as a result, soil-sampling methods were further developed and were applied to all plots on which potatoes had been grown (in 1933) within a considerable distance from Tilbury (approximately from Rainham to Southend). This work resulted in the discovery of 9 infested plots in addition to that found in August, the most distant from Tilbury being one at South Stifford, three miles from Tilbury Station.

Although there had been no previous evidence to suggest that Colorado Beetles would be found on the Kentish side of the river, the success of the soil-sampling method in disclosing beetles suggested that, as a precaution, a trial should be made at Gravesend, with the result that, early in 1934, the pest was detected in a block of allotments on the outskirts of that town. A systematic examination of the whole of the Gravesend district was at once begun, and by the end of April, when the inspections had extended to Rochester in the east and Dartford in the west, 10 infested places in all had been found in Kent, the most distant from Gravesend being one at Chalk, $1\frac{1}{2}$ miles from the Gravesend landing stage. The exact position of the different infested places, both in Kent and Essex, is shown on the accompanying map.

Each place where beetles were discovered was treated with carbon disulphide, as described in the previous article,



COLORADO BEETLE AT TILBURY.—II

and, for additional safety, the treatment was* always extended to a zone of land somewhat beyond that in which the soil sampling had disclosed the presence of the pest.

The winter's work, which owing to the Kentish discoveries was prolonged into the spring, finished on May 2, 1934. Both in respect of soil sampling and the carbon-disulphide treatment, the season had been extraordinarily favourable, and the soil was in an almost ideal condition for these operations. If the autumn and winter had been wet, it is doubtful whether the soil sampling could have been carried on, or at least whether such a large area could have been covered. This will be realized when it is learnt that during the soil sampling some 2,000 tons of soil were lifted, sieved over and examined, handful by handful, a proceeding that would be difficult in the extreme with wet soil. The carbon-disulphide treatment also gives the best results with soil that is open and not too wet; here again, if it had been necessary to deal with soils that were heavy or waterlogged, poor results would have been probable. Therefore, while the winter campaign revealed a situation that was potentially of the utmost gravity, the conditions of the season at least favoured the carrying out of control measures.

Summer of 1934.—At the beginning of the summer, then, the position was as follows:—Every known infested place had been treated in such a way as to render it improbable that many Colorado Beetles would have survived, but it was not considered impossible that here and there an occasional individual might have escaped. Further, the soil-sampling method of detecting beetles had not previously been tested, and the extent to which reliance could be placed upon it was uncertain. Finally, there remained the possibility of centres of infection outside the area that had been examined in the winter. There was clearly no alternative, therefore, but to treat all the country in the neighbourhood of Tilbury and Gravesend as potentially infested, and a still wider zone as under suspicion. The practical effect of this was as follows:—

(1) In the first place, the potato crops in Essex and Kent would require supervision during the greater part of the summer, the supervision being specially close and continuous on and in the neighbourhood of places known to have been infested, and sufficiently thorough to disclose colonies of the insect elsewhere.

COLORADO BEETLE AT TILBURY.—II

(2) Secondly, in view of the difficulty of detecting isolated beetles, those crops to which such beetles might spread, or might have spread during the previous year, would need to be sprayed as a precautionary measure.

A detailed description of how these two requirements were met would occupy considerable space, and only a general summary of what was done need be given here. The records of the earlier outbreak in 1901-02 showed that beetles that had spent the winter in the soil were first discovered on the young potato foliage on May 31, but since there are reasons for supposing that they may have emerged from the soil some days earlier, daily examinations of the infested places and adjacent crops on the present occasion were begun in early May; and these danger areas were kept under close observation for the remainder of the summer. From May 28 onwards, a force of inspectors examined all potatoes within a 10-mile radius of the infested places, and made a more general inspection of crops in Essex and Kent beyond the 10-mile radius. This field inspection, which covered over 9,000 acres of potatoes, was repeated during the month of August. In order to carry out the spraying, a contract had been made with Associated Spraying Contractors, Ltd. (which included the previous contractors), and it was decided to treat all crops within approximately six miles of any of the infested places. This work was carried out between June 5 and July 5, the length of time involved being due to the fact that in the districts in question there were large areas both of "earlies" and "lates," and when spraying was begun many of the late crops were hardly through, while some of the earlies were almost ready to dig. In consequence, the sprayers had to go through the whole district twice over, which greatly added to the work and complicated the organization, but in the circumstances was unavoidable. The weather, except at the start, was entirely favourable for the spraying itself, but the continued drought involved the carting of water for long distances and was a serious handicap. In all 4,011 acres* were sprayed under the contract—1,759 acres in Essex and 2,252 acres in Kent. These totals only include field crops. The spraying of allotments and gardens in the danger areas of Tilbury and Gravesend was carried out directly by the Ministry, two gangs of sprayers with knap-

* Certain German and Dutch descriptions of the campaign in England state that approximately 4 acres only of potatoes were sprayed, the error being due to the fact that 4,011 was read as 4'011.

COLORADO BEETLE AT TILBURY.—II

sack machines being employed. Since it was considered undesirable to use a poisonous spray in allotment or garden conditions, a Derris insecticide was substituted for the arsenical mixture employed for field crops. Derris insecticides have not the lasting properties of those containing arsenic, but this disadvantage was not material with crops that were under such close observation that living beetles could hardly escape detection.

The Results.—As the summer advanced, it became evident that the winter's work already described had achieved a very considerable measure of success. One or two dead beetles were found in the spring by allotment holders when digging soil that had been treated with carbon disulphide, but the first evidence of the recent presence of living beetles was the discovery on May 16 of a single specimen on one of the infested places at Tilbury. On none of the other infested places, nor on adjacent potato crops, were any beetles found until July 6, when a single example was detected just outside the infested allotments at South Stifford. A detailed re-examination of the crops in the neighbourhood failed to disclose any other beetles, and it would seem that this was an isolated specimen that had escaped, or more probably partially escaped, the fumes of the carbon disulphide. The inspection of the field crops in Essex and Kent disclosed no further centres of infection, and as the examination was very thorough, there are reasonable grounds for supposing that no such colonies existed. That an occasional beetle may have escaped detection is not, of course, impossible, since there can be no certainty of finding a single beetle in a potato field; but, as was explained in the previous article, the precautionary spraying of a wide belt of potatoes around the known infested places is designed to deal with such isolated and undetected insects, and it may not unreasonably be hoped that any stragglers that may have reached the potato fields in Essex and Kent were prevented from founding fresh colonies.

The present position, therefore, is that there is no place in the country that is now definitely known to be infested. It goes without saying that the counties in which the beetles have been found must be regarded as under suspicion for at least another twelve months, and that the potato crops will again have to be carefully inspected, but unless another

COLORADO BEETLE AT TILBURY.—II

colony is discovered or there are other indications of the persistence of the pest, precautionary spraying this year (1935) would seem to be unnecessary.

Conclusion.—In the previous article, the invaluable co-operation of the general public, and notably of the farming community, was acknowledged; and a similar acknowledgment must be made in respect of the operations in the summer of 1934, but with even greater emphasis, since the very success of the previous work and the consequent lack of any signs of a devastating plague might easily have led to a premature feeling of security and consequent apathy. It is therefore notable that growers of potatoes were as keen in 1934, as they were in 1933, that no precautions should be omitted that might lead to the complete eradication of the pest.

Naturally, interest during the year centred largely on the events in Essex and Kent, but it is also worthy of mention that the ever-present risk of a new invasion elsewhere was not neglected. The Ministry's inspectorate, with the co-operation of certain of the Advisory Entomologists and members of County Agricultural staffs, made a survey of the potato crops in every area to which it seemed likely that the pest might gain admittance, and wherever "suspicious" damage to the potato foliage was seen the circumstances were fully investigated. No new outbreak was, however, discovered. Very large numbers of insects, suspected to be Colorado Beetles, were again sent in for identification by farmers and gardeners, and it is greatly to be hoped that the same course will be followed in future years, since vigilance on the part of the general public will go far to prevent a colony of the pest from being overlooked.

Finally, it is of interest to note that in July, 1934, an outbreak of the Colorado Beetle was detected near Stade, in Germany, approximately in the same district in which the pest occurred in 1914. The outbreak seems to have been on the scale that would have been expected at Tilbury if the beetle had not been discovered there until 1934. The measures applied by the German Government to eradicate the pest are, in principle, those employed in Kent and Essex, the details being modified to suit German conditions. Reports received suggest that they have attained the same initial success; but of course in Germany, as in England, the exact degree of success will not be known for another year.

THE BROCCOLI INDUSTRY

C. H. OLDHAM, N.D.H.,

Ministry of Agriculture and Fisheries.

As ten years have elapsed since the first steps were taken to improve the types of winter cauliflower grown in this country, as well as the methods of packing them for market, it may be opportune to review the state of the industry during this period, and draw some conclusions about its position at the present time.

Conditions in 1924.—British growers of broccoli were finding an increasing difficulty in effecting remunerative sales, the position becoming acute about 1924, when the coarse broccoli grown in the western counties, and packed in wicker hampers, had become almost unsaleable. Inquiries showed that ungraded produce, in unsuitable containers, would not sell in competition with the graded and well-packed imported produce. Supplies from overseas, mainly from St. Malo and Roscoff in Brittany, and smaller quantities from Italy, consisting of high-quality heads, well-graded and in suitable crates, were being easily disposed of to the extent of thousands of tons. Moreover, the curd of the imported broccoli was white and firm, and preferred by the consuming public, the yellow-curd home varieties being no longer in demand. Apart, too, from the unpopular colour of the curd, the home-grown varieties often reached the market in soft condition, and were bruised and spoilt in consequence.

On the production side, it was found that, apart from unsuitable strains, it had been a general practice to leave insufficient space between plants, this resulting in small heads; also that the manuring needed correction, the soft curd—a great defect—resulting from the application of too much nitrogen.

Seed-saving methods also required attention. Usually a patch at one end of a field, or on a headland, was reserved for this purpose: in such a patch, no heads were cut nor roguing attempted, the question whether the plants for seeding purposes exhibited good or bad qualities being disregarded. It is true that, up and down the country, there were a few growers who selected and rogued seeding plants,

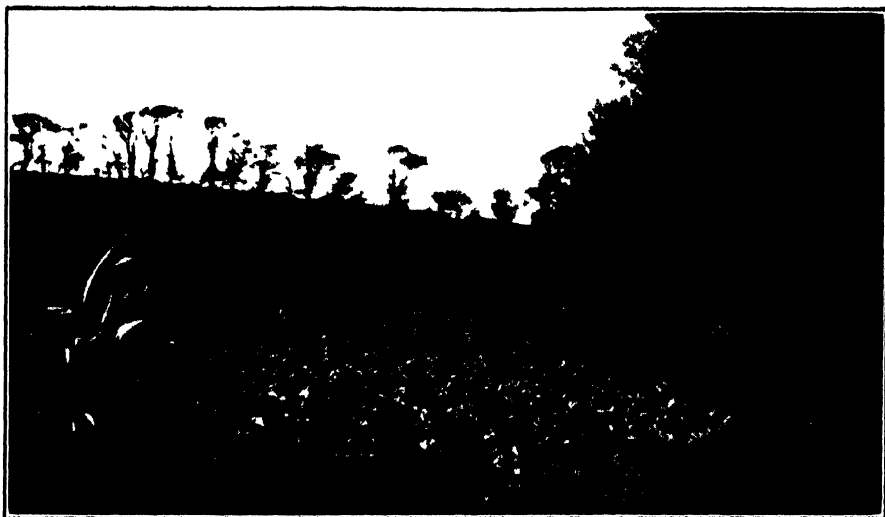
THE BROCCOLI INDUSTRY

but their number was practically negligible. In the areas with a large number of small growers, each man saved his own seed regardless of the type that his neighbour was seeding on the other side of the hedge. Thus, in Cornwall, where early, midseason, late, and "dead-late" Penzance strains were grown in congested areas, cross-pollination occurred, and it was impossible to keep pure and selected stocks free from contamination.

Introduction of Roscoff Broccoli.—The Cornwall Agricultural Education Sub-Committee have, for several years, undertaken breeding and selection work at the Gulval Demonstration Plot; and, at this centre, a large number of white-curled standard varieties of broccoli were grown, selected and crossed. Upon the introduction, in 1924, of the Roscoff variety to the plot, it was decided, however, to concentrate upon this strain, and to discard eventually, previous crosses which, in general, compared unfavourably with the Roscoff type. Plants and seed of the Roscoff strains were distributed from the Gulval Plot from 1924 onwards.

Further progress was made in 1926, when a grower at Gulval decided to seed $\frac{3}{4}$ acre of Roscoff, the plants being carefully rogued. The distribution of seed from this harvest, also of seed from a few well-known seed merchants who had obtained small quantities of Roscoff seed, sufficed to establish the growing of Roscoff broccoli in this country; and, in the following season, prices for the home-grown Roscoff were as good as, and in some instances better than, those for the imported supplies.

The Western Commercial Show.—No note on the introduction of Roscoff broccoli into this country would be complete without a mention of the assistance rendered by the organizers of the Western Commercial Show at Penzance. This was first given in 1924, when a demonstration of the grading and packing of a Roscoff crate was followed by a discussion, attended by a large number of growers; and the atmosphere of this meeting, if not definitely hostile, was certainly very critical. On this occasion, the Cornish wicker was condemned as a marketing receptacle by the reformers; but those who had been using it for 30 years or more were not inclined to discard it without protest. In subsequent years, other conferences were organized by the Show Committee, and the experiences



A fine field of Broccoli at Gulval (September, 1934)



Photos H. C. Long.

Broccoli in foreground and market garden fields generally at Gulval,
looking towards Marazion - St. Michael's Mount in the distance
(September, 1934)

THE BROCCOLI INDUSTRY

of salesmen, advisory officers and growers were pooled for the common good. The Show Committee eventually arranged classes for packed broccoli in Roscoff crates; and the entries in these classes have increased with each succeeding year, until, at the last Show (1934), there was a record entry, despite low temperatures in the spring and adverse growing conditions during the season. The Show authorities have further assisted the progressive movement by instituting classes for broccoli grown in the field. These classes, established in 1927, have since been conducted each year; and it is significant that the awards have gone to Roscoff strains grown from seed either distributed originally from the Gulval Plot, or from well-known seed raisers.

Other help by the Western Commercial Show has taken the form of competitions in the packing of broccoli in Roscoff crates. These, held annually since 1927, comprise classes for employers and employed, and the number of entries has increased year by year.

Breeding of Improved Strains.—Although, since 1927, a considerable area of Roscoff broccoli has been grown in Cornwall and other counties, it gradually became apparent, when inspecting crops, that the type was becoming less true, and that crosses between the Roscoff and other types, notably the Penzance, were occurring. This retrograde development was mainly due to the seeding of Roscoff strains in close proximity to other types, and had it been allowed to continue, the position of the industry would have reverted to that prevailing in 1924. It was, therefore, arranged to establish breeding centres for the improvement of the type; and a grant was made to the Seale-Hayne Agricultural College, by the Ministry, to enable improved strains of broccoli to be provided for the western counties, Mr. F. R. Horne being placed in charge of the work. By means of this grant, and through the skill and keenness of Mr. Horne, assisted by the advisory officers in Cornwall and Devon, pure stocks have been secured and grown for demonstration purposes in broccoli areas in those counties.

In addition, the Horticultural Research Station at Cambridge took up this work in 1928, commencing by growing selected strains; but the rigorous winter conditions here proved to be unfavourable for the growing of Roscoff. Suitable plants were, however, selected in Dorset, Hants and Wilts and removed to Cambridge for breeding pur-

THE BROCCOLI INDUSTRY

poses, the resultant seedlings being grown-on at a suitable site at Hayling Island in Hants, where conditions were found to be favourable for the growing, selection and seeding of these types.

A start was also made at Cambridge to produce a Roscoff type of hardier constitution, suitable for commercial purposes in counties with less favourable climatic conditions. This phase of the plant breeding of Roscoff winter cauliflower has given many interesting results, and the work is being continued. Besides this production of a hardy strain, Cambridge has attempted to breed strains of Roscoff to "head in" at definite periods from early January onwards; and some success in this direction has already been obtained. Seeds of such strains were distributed in Kent, Sussex, Hants, Derbyshire, Dorset, and in North Wales; but, on account of difficult growing conditions, any report of the results would be premature. The abnormal weather conditions during the early part of 1934 adversely affected even standard varieties, in all areas, as regards the time of "heading in."

Apart from the work of the plant breeding centres, certain growers in Wilts, Kent, the Isle of Wight, Devon and Cornwall, have turned their attention to seed production, including rogueing and selection, of the particular type of winter cauliflower required.

Improved Methods of Cultivation.—Turning from seed production to cultivation, methods have been much improved during the past few years. As previously stated, growers were prone to plant too closely, thus preventing a full development of foliage and curd. A distance of $2\frac{1}{2}$ or 3 ft. between plants is now the rule. More care is exercised in controlling the flea beetle in the seed-bed; and, by ascertaining that the soil has a suitable lime content, damage by "clubbing" is minimized. In recent years, also, growers have made it a rule to sow seeds later than formerly, many having found that early March sowing resulted in a large hard plant that failed to "get away" when planted in its permanent quarters. The rotation of crops, and the effect of one crop upon another, have also received attention; and manures are being applied to adjust soil conditions and produce a balanced effect.

Future Development.—The industry has several problems yet to be solved, for while the Roscoff types of

THE BROCCOLI INDUSTRY

broccoli have given remarkably good results, and have become popular, experience during adverse cold seasons has proved that they are less hardy in the more exposed counties than some of the d'Angers varieties, or those established types offered by reputable seed firms who cater for the market gardener. On certain soils, too, especially the light sands of the Lower Greensand formation, the Roscoffs have, in several instances, proved less suitable than the varieties that, for many years, have been offered by the best seed firms. Moreover, growers in the northerly areas have evolved a type of broccoli that, although not "turning in" before April, has proved admirable for northern markets, and this type has been cultivated for several generations. Caution is necessary, therefore, in the selection of a variety for a particular district.

Effect of Import Duties.—Growers have responded well to the call, following the imposition of duties upon winter cauliflower from overseas; and this protective measure has, undoubtedly, been responsible for the recent increase in the area under this crop at home. The general farmer, as well as the market gardener, has turned his attention to its cultivation, even in areas where little broccoli was grown before. In addition to the well-known areas in Cornwall and Kent, there has been an increase of production in Devon, Dorset, Hants, the Isle of Wight, Sussex, Essex, Wilts, Worcestershire, Warwickshire, Staffordshire, Derbyshire and Yorkshire, and North Wales is seriously considering the growing of broccoli in larger quantities. This increased area, even allowing for the restrictive effect of import duties on overseas supplies, may, in suitable seasons of favourable growth, result in over-production. It is true that, in such counties as Cornwall, broccoli growing, taking one season with another, will pay; but, in this county, the climate contributes to an early cut, and frosts are seldom hard enough to kill an entire crop. Other counties may not have the same advantages.

National Mark Cauliflower and Broccoli Scheme.—Early in 1933, the National Mark Scheme for Cauliflower and Broccoli, which had been prepared after consultation with the National Farmers' Union and other interested bodies, came into operation. The scheme* provides for

* See the Ministry's Marketing Leaflet No. 58.

THE BROCCOLI INDUSTRY

three grades, two being suitable for broccoli, viz., *Selected* and *Selected Large*. The definitions of quality for these grades specify the requirements of the Scheme as regards size, colour and condition of the heads, the absence of blemish, and the methods of trimming butts and wrapper leaves. An important feature of the Scheme is the use of standard packages for the consignment of National Mark broccoli to market. Many broccoli growers have enrolled in the Scheme, and this step may be taken as a recognition by them of the fact that proper grading and packing are essential if their produce is to hold its own with imported produce, which is well-graded and suitably packed, and commands a fair price. It is interesting to note that the opposition to the use of the Roscoff crate, manifested in 1924 and following years, has now ceased; and this crate, which is specified as a standard container in the Scheme, is now in general use.

The 1933-34 Season Results.—Some account of the season just ended may be desirable. In 1932-33, most varieties came through the season without injury, but the conditions in 1933-34 proved adverse. Planting in the summer of 1933 was often delayed by drought, and no favourable growing weather prevailed until October. In the less favoured counties, soil temperature was then so low that only a minimum of growth was possible. During the summer, also, the ravages of the larvæ of the Cabbage White Butterfly were experienced to the fullest extent, and growers who failed to adopt control measures lost the majority of their plants. In Cornwall, in mid-September, the larvæ were prevalent in large numbers, and, in many instances only the midrib of the leaves was left. As the season advanced, less was seen of the pest as it passed into the next stage of its life cycle, and normal conditions prevailed until about the middle of December, excepting that dry soils were a feature in most areas.

The plants had a limited root system, owing to insufficient soil moisture following the check caused by incessant cold winds and frost up to the end of March, 1934; and, in most counties, large areas of broccoli plants were completely killed. The main cause of failure, however, in the more favoured areas was the persistent drought, resulting in small leaf development and still smaller curds. Varieties of all types were abnormally late, and those usually "turning

THE BROCCOLI INDUSTRY

in " about February were only⁴ suitable to cut in mid-March.

Those concerned with the selection of plants for seeding and breeding purposes found it difficult to distinguish type by foliage characteristics, and the work generally was carried on under great difficulties. Such a combination of adverse conditions had never before been encountered in the writer's experience of the industry.

ACKNOWLEDGMENT.—This brief review of ten years' work shows that much improvement has been effected in home broccoli growing, and this is due to whole-hearted support from all sections of the industry. It could not have been achieved without the help of growers, seedsmen, salesmen, research workers, the horticultural advisory officers of various counties, and the organizers of the Western Commercial Show, all working for the common good with the full support of the Ministry.

THE CONTROL OF FLEA BEETLES IN SEED-BEDS

F. R. PETHERBRIDGE, M.A., and I. THOMAS, Ph.D.,
School of Agriculture, Cambridge.

FLEA Beetles, sometimes known as Fly, Turnip Flea or Turnip Fly, are in some seasons the cause of very serious losses to vegetable growers in this country. The biology of the species concerned has been studied in some detail by Newton,* who has also reviewed the control measures that have been adopted from time to time. These have consisted chiefly of dusting or spraying the seedlings, treating the seed before sowing, rolling when the dew is on the plants, running sheep over the seed-beds, and trapping with various types of apparatus such as tarred sacks and greased boards. None of these methods, however, has given consistently good results.

Since the extremely severe attack on the various members of the cabbage tribe that occurred in 1930, the authors have conducted a series of experiments on the control of Flea Beetles in the market-gardening areas of Bedfordshire, in co-operation with the County Agricultural and Horticultural Organizer, Mr. J. W. Dallas. A number of contact insecticides, stomach poisons, and deterrents have been tested, and observations have been made on the use of some cruciferous plants as trap crops.

In 1931, the Flea Beetle attack was not nearly as serious as in 1930, and in 1932 and 1933 the attack was slight and no conclusive results were obtained; this season (1934), however, the attack has been very severe and the results obtained have been fairly conclusive.

Life History and Nature of Attack.—According to Newton, the Flea Beetles hibernate as adults throughout the winter among fallen leaves in hedgerows, in the grass borders of fields and under the bark of trees, the striped ones in particular migrating to woods. During the course of the present investigation, a careful search was made in such places, especially the grass borders of fields. The beetles were rarely found in sufficient numbers to warrant

* The Biology of Flea Beetles attacking Cultivated Cruciferae. *Jour. S.E. Agric. Coll., Wye, Kent*, No. 25, July, 1928. Experiments on the Control of Flea Beetles of the Genus *Phyllotreta* Injurious to Cultivated Crucifer Crops. *Loc. cit*

CONTROL OF FLEA BEETLES IN SEED-BEDS

burning; where, however, such borders are easily burned, then burning over should undoubtedly be done.

In Bedfordshire, the first of the cabbage tribe to be sown is brussels sprouts. The seeds are drilled in beds about the middle of March, followed about three weeks later by Christmas Drumheads and cauliflowers. The seeds-beds are usually carefully prepared; where, however, a good tilth is not obtained, an early underground attack of Flea Beetle may result.

Newton has emphasized the importance of this attack, and it cannot be over-emphasized. A farmer often finds that his seedlings do not appear above ground as soon as they should; on examination, it has been found that Flea Beetles have been busy below ground and that the hypocotyls have been eaten through. It is possible for this attack to occur without any Flea Beetles having been seen above ground. Such an attack occurs in April, is often very serious, and is generally ascribed to frost.

In early May, with the first onset of warm weather, the beetles appear above ground in very large numbers, and the cotyledons are attacked, cauliflowers being especially susceptible to injury at this stage. At this period, a field may be almost free from Flea Beetles in the morning and yet may be swarming with them in the evening of the same day.

With a mild attack, plants may be said to be fairly safe when they have reached the rough-leaf stage; but, in such seasons as 1930 and 1934, when the beetles were present in very large numbers, plants in the rough leaf were eaten off and brussels sprouts were skeletonized even after they had been planted out.

The species of Flea Beetles found attacking cabbage plants during the course of the present investigation were the following:—*Phyllotreta undulata*, *P. nemorum*, *P. punctulata*, *P. consobrina*, *P. atra*, *P. nigripes* and *P. cruciferae*.

Egg-laying takes place during May and throughout the summer until August. Eggs are laid on the ground near the plants, and with the exception of the Lesser Striped Flea Beetle (*P. undulata*), the larvæ feed on the roots of the plants; the larvæ of *P. undulata* crawl up and mine into the leaves. Pupation takes place in the soil, and the adults that emerge in late summer feed for a period before going into hibernation for the winter.

CONTROL OF FLEA BEETLES IN SEED-BEDS

Losses due to a severe Flea Beetle attack amount to a very large sum. The seeds of some of the cauliflowers grown are very expensive, amounting to as much as £3 per lb. Sometimes seed-beds have to be sown a second and even a third time—and this means extra seed and extra labour. In addition, there is the loss due to late sowing, which often means a lighter crop and late marketing.

Trap Crops.—The following crops were sown alongside Christmas Drumhead cabbages: cress, rape, swedes, white turnips and mustard.

The Flea Beetles showed a distinct preference for white turnips, and it was observed that where a few white turnip seeds had been sown accidentally in the seed-beds, they were very severely attacked. Large numbers of beetles were also present on the other trap crops sown.

It is possible that if white turnips were sown along the hedgerows of fields they might attract the beetles when they come out from their hibernating quarters. They could be sown so as to come up shortly before the plant beds; and, when large numbers have been attracted, these could be killed with a Derris dust.

Experiments in 1931.—Several field trials were conducted in 1931, when the following substances were tested:—

- (1) 10 per cent. nicotine sulphate dust.
- (2) 3 per cent. and 4 per cent. nicotine dusts.
- (3) Hydrated lime.
- (4) Sulphur plus lead arsenate dust.
- (5) Heavy Derris dust.
- (6) A proprietary dust containing a large amount of lime.
- (7) Naphthalene, grade 16.

The above dusts were applied to duplicate plots with a rotary chest duster in amounts varying from 30 to 100 lb. per acre. Two, three or four applications were made at intervals depending on the weather and extent of attack. The first application of naphthalene, at the rate of about 1 cwt. per acre, was made just as the plants were coming through the ground.

Although no conclusive results were obtained from these experiments, several interesting observations were made, which suggested lines for further trials.

(1) *Nicotine sulphate dust, 10 per cent.*—From a newly-opened drum, this dust was easily applied, a small percentage of the beetles were killed and a fair measure of control was obtained. On keeping, however, the dust

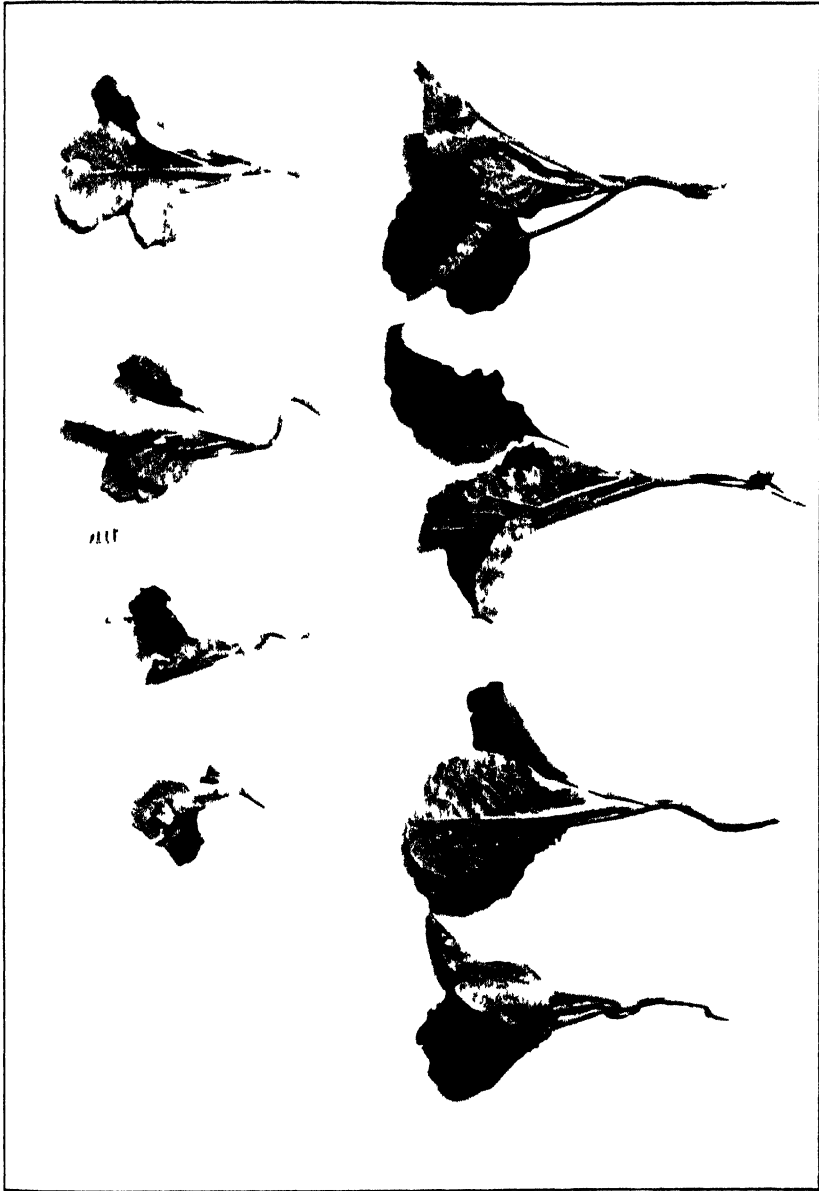


Photo F. R. Petherbridge

Top Row Typical plants from untreated plot

CONTROL OF FLEA BEETLES IN SEED-BEDS

became lumpy, was difficult to apply and did not cover well. On brussels sprouts, drilled on March 6, nicotine sulphate dust was applied on April 8, April 11, and May 6. This increased the number of plants by 29 per cent. as compared with the control plots. In another experiment with cauliflowers, drilled on April 7, and dusted on May 7 and 21, the number of plants was increased by 36 per cent. In a third experiment on cauliflowers, however, the number of plants on the nicotine sulphate plots showed no increase over the controls.

(2) *Nicotine dust, 4 per cent.*—When this dust was used on a warm day, it apparently killed all the Flea Beetles that were touched by it, but closer observation showed that about 50 per cent. of the apparently dead beetles recovered some time afterwards. The results obtained were very variable. In one instance, four dustings of Christmas Drumhead cabbage plants increased the number of plants, per foot length of row, from 2 on the control plots to 7 on the dusted plots. The seeds were drilled on April 27, and the first dusting was done on May 6 (before the plants were through), in an attempt to prevent the underground beetle attack. The later dustings were made on May 13, 20, and 26. In an experiment on brussels sprout plants, three dustings gave an increase of 29 per cent., and, on cauliflowers, two dustings gave an increase of 47 per cent. in the number of plants. With a more intensive attack of Flea Beetles, where the tilth was rough, plots dusted twice were as badly attacked as the control plots.

(3) *Hydrated lime.*—The indications were that if this very finely-powdered form of hydrated lime was to be used, then heavy and frequent applications would be necessary. It seems that any very finely-powdered dust is effective as a deterrent if used in large quantities.

(4) *Sulphur plus lead arsenate dust.*—This dust gave some measure of control but was not easily applied with a rotary blower. The number of brussels sprouts plants in the bed that was drilled on March 6 and dusted on April 8, April 11, and May 6, was increased by 30 per cent., while two dustings on cauliflowers gave an increase in the number of plants over the control of only 18 per cent.

(5) *Heavy Derris dust.*—Poor results were obtained with this dust, the dusted beds being as severely attacked as the controls. The dust was also difficult to apply with a rotary blower and caused a certain amount of injury to the plants.

(6) *Proprietary dust containing a large amount of lime.*—The results with this dust were similar to those obtained for hydrated lime. It was found that heavy and frequent applications would be necessary to give a satisfactory control; this dust was easy to handle and gave a good cover.

(7) *Naphthalene, grade 16.*—This was broadcast on the beds at the rate of about 1 cwt. per acre, the first application being made before the plants were through the ground, so that it might act as a

CONTROL OF FLEA BEETLES IN SEED-BEDS

deterrent and prevent the underground attack. The plants in the plots dressed with naphthalene always looked better than plants in the other plots. In one experiment, the number of plants was increased by 40 per cent., and in another by 28 per cent. Naphthalene did not kill the beetles but paralysed them for a short period. With a severe attack, naphthalene alone would not give a sufficiently good control.

The conclusions arrived at from the above observations and experiments were as follows:—

- (1) Tilth should be fine, as otherwise there is more likelihood that serious injury may be done when the plants are coming through.
- (2) In order to prevent this early underground attack an application of a dust, preferably naphthalene, should be made before the plants are through the ground. This should be done regardless of the weather unless it is raining heavily.
- (3) For subsequent dustings, a dust that kills a large percentage of the beetles is necessary. Up to the present the best is 4 per cent. nicotine dust. If the first dusting does not kill them, then heavy and frequent applications should be made.
- (4) The covering power of a dust is an important factor: the dust should be light and easily applied with a rotary blower.
- (5) If the dusts are washed off by rain, the plants must be dusted again immediately the weather becomes fine.

Experiments in 1934.—The Flea Beetle attack in 1934 was nearly as severe as in 1930. Experiments were carried out on lines similar to those described above. Dusts that were difficult to apply with a rotary duster were not used again, and lighter Derris dusts having a 0.2 per cent. Rotenone content were included for trial. The following is a list of those used:—

1. 3 per cent. Nicotine dust.
2. Light Derris dust (0.2 per cent. Rotenone).
3. Medium Derris dust (0.2 per cent. Rotenone).
4. Hydrated lime.
5. Proprietary dust containing a large amount of lime.
6. Naphthalene, grade 16.

Table I gives details of an experiment carried out at Mr. F. Inskip's Farm, Langford. The cauliflowers were not quite through the ground on April 23, when the first dusts were applied. Large numbers of beetles were present when the second dusting was made on May 2. Very fine weather was experienced at this period; this continued throughout May and June, the Flea Beetle attack being intense the whole time. The plots were 4 yd. wide by 12 yd. long, and the dusts were applied with a rotary duster as before.

On May 28, a count was made of the number of plants in three one-foot lengths of every drill across each plot. The average number of plants per foot is recorded in Table I. In the last column of this table are recorded figures that indicate the condition of the plants in each plot, 100 being a perfectly clean plot. These figures, together with the

CONTROL OF FLEA BEETLES IN SEED-BEDS

number of plants per foot length of drill, give an indication of the extent of the attack on each plot.

TABLE I.—EXPERIMENTS ON CAULIFLOWERS AT LANGFORD
(BEDFORDSHIRE).

<i>No. of Plot.</i>	<i>Treatment.</i>	<i>Lb. per acre.</i>	<i>No. of Applications.</i>	<i>When Applied.</i>	<i>Plants per ft.</i>	<i>Marks for Condition of plants.</i>
1	Light Derris dust	65-85	4	April 23, May 2, 7 and 10	14.9	80
12	Ditto	„	3	May 2, 7 and 10	14.5	80
14	Ditto	„	3	May 3, 7 and 10	13.2	75
16	Ditto	„	3	May 3, 7 and 10	13.5	70
3	Medium Derris dust	125-150	4	April 23, May 2, 7 and 10	13.1	65
7	Ditto	„	4	April 23, May 2, 7 and 10	13.7	60
2	3 per cent. nicotine dust	50-75	4	May 2, 7 10 and 12	12.5	65
11	Ditto	„	4	Ditto	11.3	75
15	Ditto	„	4	May 3, 7 10 and 12	11.2	60
4	Hydrated lime	75	5	April 23, May 2, 7, 10 and 12	12.8	50
9	Ditto	175	5	April 23, May 2, 7, 10 and 12	12.3	60
6	Proprietary dust	125	5	April 23, May 2, 7, 10 and 12	11.8	35
10	Ditto	250	5	Ditto	9.7	50
5	Control				8.6	25
8	Control				9.2	30
13	Control				9.7	35

About 40 per cent. of the plants on the control plots were killed; but this figure, alone, does not give a true indication of the severity of the attack, because the remaining plants were badly damaged and stunted and of little market value as compared with the plants in the best plots. Both the Derris dusts killed a large percentage of the beetles, as did the nicotine dusts, on a really hot day; but beetles could be seen on the nicotine plots the day after dusting, whereas they did not appear again on the Derris plots for three to four days.

It will be noted that the best control was obtained with a light Derris dust applied four times, the plots which had only three applications being nearly as good. The cost of

CONTROL OF FLEA BEETLES IN SEED-BEDS

material per acre for four applications was about £4 16s. The control obtained on the medium Derris dusted plots was also fairly good; but there was a considerable amount of Flea Beetle injury on these plots, although nearly twice the weight of dust was applied. The cost of material for four applications was about £9 10s. per acre.

The plots dusted four times with a 3 per cent. nicotine dust had almost as many plants per foot as did the Derris plots, but the amount of injury was considerable on these plots. The cost per acre of materials for four applications was about £6.

Five applications of hydrated lime effected a fair control, especially at the heavier rate of about $1\frac{3}{4}$ cwt. per acre, the cost of material per acre for five applications being about £2 4s. The proprietary dust did not give a good control, but the plot dusted at the heavier rate— $2\frac{1}{4}$ cwt. per acre—was better than the plot dusted at 1 cwt. per acre. Five applications of this dust, at $2\frac{1}{4}$ cwt. per acre, would cost about £6.

A second experiment on cauliflower plants was also carried out, at Langford, on a farm belonging to Mr. E. M. Street; single plots were employed, each plot being 21 yd. by 10 yd. Plants were not quite through the ground on April 23. The treatments, average number of plants per foot, and marks given for condition of plants are shown in Table II. The amount of dusts applied per acre was about the same as in the previous experiment.

TABLE II.

<i>No. of Plot.</i>	<i>Treatment.</i>	<i>Plants per foot.</i>	<i>Marks for condition of Plants.</i>
1	Light Derris, April 23, May 2, 7 and 10	15.0	80
2	Control	10.9	35
3	Naphthalene, April 23; nicotine dust, May 2, 7, and 10 ..	14.1	55
4	Proprietary dust, April 30; Medium Derris, May 2, 7 and 10	17.6	80

The above data indicate that both the medium and the light Derris dusts gave an excellent control of Flea Beetle. The results are not strictly comparable because there were four applications of the light dusts and three of the medium dusts, the latter being after a heavy application of proprietary dust on April 30.

Three applications of nicotine dust, following 2 cwt. per acre of naphthalene on April 23, gave an average of 14.1

CONTROL OF FLEA BEETLES IN SEED-BEDS

plants per foot; but the damage by Flea Beetle on this plot was very considerable.

The control plot had an average of 10.9 plants per foot, but the injury on this plot was very severe and the market value of the plants was small.

Plants from plots 1 and 2 are shown in the accompanying illustration. The control plants are typical of those from seed beds that have been attacked by Flea Beetle in the early stage, although they show very little of the typical Flea Beetle gnawings.

A third experiment was carried out on the farm of Mr. T. H. Ream (Porto-Bello Farm, Sutton, Bedfordshire), but in this instance very severe damage was done to the plants before they came through the ground. The first dusts were not applied in time to prevent this attack, and the number of plants per foot was only about three, even on the best plots. The amount per acre of each dust applied was about the same as in the previous experiments; the plots and treatments are shown in Table III.

TABLE III.

<i>No. of Plot.</i>	<i>Treatment.</i>	<i>Plants per foot across each Plot.</i>
1	Naphthalene, April 23; Light Derris, May 2, 7 and 11	110
2	Light Derris, April 23, May 2, 7 and 11 ..	134
7	Ditto	105
4	Nicotine dust, April 23, May 2, 3, 7 and 11	109
5	Medium Derris, April 23, May 2, 7 and 11	115
6	Ditto	101
3	Control	24

The effectiveness of the various treatments and the amount of Flea Beetle injury on the plots may be judged from figures in the third column, which give an average of two counts of the plants in 1-foot lengths of drill across each plot; there were 45 drills in each plot. The few plants left on the control were not good enough to plant out, and the plants on the nicotine plot were also very poor.

On a second bed of cauliflowers, on the same farm, an almost perfect plant was obtained by using Derris dust. Barium fluo-silicate used on the same bed was ineffective. In order to save the plants on this plot, Derris dust was used.

Summary and Discussion.—Experiments have been conducted on the control of Flea Beetles on *Brassicae* seed-

CONTROL OF FLEA BEETLES

beds, using the following materials:—

1. Naphthalene, grade 16.
2. 3 per cent. and 4 per cent. nicotine dust.
3. 10 per cent. nicotine sulphate dust.
4. Heavy Derris dust.
5. Medium Derris dust (0.2 per cent. Rotenone).
6. Light Derris dust (0.2 per cent. Rotenone).
7. Hydrated lime.
8. Proprietary dust containing a large amount of lime.
9. Sulphur plus lead arsenate dust.
10. Barium fluo-silicate dust.

Of the above, the best results have been obtained with dusts 5 and 6, the medium and light Derris dusts, the latter having the advantage of being cheaper because a smaller weight per acre is required. Dusts, such as hydrated lime, are useful if applied frequently and in large quantities. Nicotine dust has given fair results, but is much more expensive. Naphthalene is useful if applied before the plants come through the ground to prevent the early underground attack, which is sometimes very severe.

In a season when Flea Beetle damage is very bad, the following procedure is recommended for *Brassicæ* seed-beds:—

- (1) Prepare as fine a tilth as possible.
- (2) Apply naphthalene or a Derris dust about four or five days after the seed is sown.
- (3) Dust with a light Derris dust as the plants are coming through the ground.
- (4) Subsequently, dust with a Derris dust at intervals of three to five days depending on the weather and extent of the attack. In the event of a severe attack, as many as five applications may be necessary.
- (5) Keep a very careful watch on the seed-beds; during fine weather they should be examined twice a day. A bed may be free from beetles in the morning and yet be severely attacked by the evening of the same day.

It is possible that this method of dusting with Derris may be applied to other crops subject to attack by Flea Beetles. If a light dust is used, about 30 lb. per acre per application should be enough if the plants are in drills about 2 ft. 6 in. apart.

In carrying out these experiments, the authors are very much indebted for the facilities afforded by Messrs. Inskip, Ream and Street, the growers on whose farms the above experiments were carried out, and to Mr. J. W. Dallas, the County Agricultural and Horticultural Organizer, for his co-operation and valuable aid.

THE CONTROL OF FLEA BEETLES WITH A NAPHTHALENE-SILICA DUST

HERBERT W. MILES, M.Sc., Ph.D.,
Victoria University of Manchester.

DURING 1933 and 1934, serious injury to seedlings of *Brassicae* was caused by Flea Beetles in north and west Lancashire and mid-Cheshire. The species present included the large Striped Flea Beetle (*Phyllotreta nemorum*, L.), the small Striped Flea Beetle (*P. undulata*, Kub.), and the Brassy Flea Beetle (*Chaetocnema concinna*, Marsh), *P. undulata* being by far the most numerous. Swedes, kale, cabbage and sprouts drilled in the field suffered severely, the cotyledons being destroyed as soon as, and frequently before, they appeared above ground. In gardens and in seed-beds, attacks were serious, but did not appear to be quite as sustained as in the fields, although in many cases supplementary seedings were necessary. Dusting the seedlings with such substances as ashes, lime, old soot and basic slag has been recommended from time to time, but the results obtained are variable. The substances are difficult to apply evenly, and Flea Beetle attack is usually well developed before the applications are made. Paraffin absorbed in sawdust and applied by hand along the rows is sometimes used against Flea Beetles in the north-west province. Application of the mixture is usually delayed until the damage is noticeable, and, therefore, serious; and the results are often unsatisfactory and the costs high.

Each season, since 1930, Flea Beetles have been abundant on swede seedlings in north Lancashire; but, in seasons favourable to the plant, recovery from attack has been rapid. In 1933, the season was dry; losses from Flea Beetle attack were widespread and re-drilling was necessary. In 1934, weather conditions in April and May were similar to those of the previous year, and that suggested that Flea Beetles were likely to be troublesome. Arrangements were made to test the value of a naphthalene dust that had proved useful in preliminary trials.

The field tests were carried out in the Cartmel district of north Lancashire in co-operation with Mr. C. P. May, M.A.,

CONTROL OF FLEA BEETLES

of the Lancashire County Agricultural Staff, and grateful acknowledgment is made to him for his able assistance.

Material and Method of Application.—The repellent dust used consisted of 50 per cent. pure naphthalene and 50 per cent. colloidal silica, costing about 35s. per cwt. The dust was exceedingly light, adhered well to the foliage and formed a remarkably even deposit. It was not unpleasant to handle and was easily applied with a double-action knapsack duster costing about 45s.

Where possible, the first application was made when the seedlings were just breaking the surface soil, but were not actually through. The operator followed the rows, directing the dust along the tops of the drills as shown in Fig. 1. Subsequent applications were made at 3-4 day intervals, according to the weather and the pressure of other work. The naphthalene dust was also tried where seedlings had already appeared above ground and severe attack by Flea Beetles was in progress. In such instances, the rows of seedlings were visible along the tops of the drills at the time of the first application of the dust.

Trials on Swede Seedlings.—In a field, where the seed had been sown on May 18, flea beetles were present in considerable numbers by May 28, when the seedlings were just lifting the surface soil. Selected drills were dusted on May 28, using about 1 lb. dust for 120 yd. of drill, or about 55 lb. dust per acre when the drills are 28 in. apart. There was no wind at the time of application, and most of the dust was deposited directly on the drills. At the approach of the dust cloud, the beetles leapt from the drills and when covered with dust immediately began cleaning themselves with legs and antennæ.

In this field, the treated drills received three dressings: the first on May 28, the second on May 31, and the last on June 4. From the first application of the dust, the seedlings on the treated drills developed evenly and rapidly and with practically no signs of leaf injury by Flea Beetles. The beetles continued to be present along the treated rows and could be seen leaping on and off the seedlings in a restless manner, but they were not observed feeding. The treated seedlings made good progress and became so thick in the rows that the farmer regretted having seeded so heavily.



Copyright H W Miles

FIG. 1. Applying Naphthalene Dust for Flea Beetle control



FIG. 2 — Typical length of this year's seedling quite free from Flea Beetle injury



FIG. 3 — Typical length of untreated seedling showing the seedlings which have survived attacks by Flea Beetles. The seed boxes are heavily injured or totally destroyed

Copyright H W Miles

CONTROL OF FLEA BEETLES

On the untreated drills, the seedlings were attacked as soon as they made their appearance above ground and the injury was so severe that for a time scarcely any green tissue could be seen. Most of the seedlings had the green seed leaves completely destroyed, and only white or brown shrivelled stems were left. With other seedlings parts of the damaged seed leaves remained attached to the stems and served to keep the plants alive.

On June 10, counts were made of the plants in random samples of one-foot lengths of drill, the counts being made at the places where a short stick fell when thrown from the site of the previous count. The figures for ten counts both on the treated and untreated rows are given in Table I.

TABLE I.

Count	<i>Treated rows</i>		<i>Untreated rows.</i>	
	<i>Plants per foot of drill.</i>	<i>Cotyledons destroyed</i>	<i>Plants per foot of drill.</i>	<i>Cotyledons destroyed.</i>
1	45	0	18	15
2	46	0	22	16
3	49	0	6	5
4	36	0	20	14
5	46	0	17	13
6	48	0	22	19
7	44	0	19	17
8	42	0	15	12
9	46	0	18	13
10	41	0	14	10
Average	44.3	0	17.1	13.4

An attempt was made to estimate the numbers of beetles present about the seedlings. The observer knelt a short distance from the drill with the sun in front so that no shadow was thrown across the drill being examined, and all the beetles that could be seen about the seedlings were counted. Counts were made on ten one-foot lengths of drill on both treated and untreated plots, and the figures obtained are given in Table II.

TABLE II.

<i>Foot length</i> <i>No</i>	<i>Numbers of beetles present about the drills.</i>	
	<i>Dusted.</i>	<i>Untreated.</i>
1	9	13
2	6	18
3	7	13
4	4	22
5	10	14
6	5	15
7	5	20
8	4	16
9	4	15
10	6	21
Average	6.0	16.7

CONTROL OF FLEA BEETLES

The figures given in Tables I and II, and the illustrations, Figs. 2 and 3, show the beneficial results following three applications of naphthalene-silica dust to swede seedlings attacked by Flea Beetles. Table I shows that on the dusted plots there were more than two and a half times as many established seedlings as there were on the plots left untreated. All the plants examined on the treated plots had the cotyledons entire, while, on the plots receiving no treatment, only 22 per cent. of the established seedlings had cotyledons present, and of these many were badly damaged by flea beetles. There were also, as shown in Table II, nearly three times as many Flea Beetles on the untreated seedlings as there were on the dusted seedlings. The outstanding differences, between treated and untreated drills, can be seen by comparing Fig. 2, showing a typical length of dusted drill, with Fig. 3, a typical length of untreated drill.

The results of the treatment so impressed the farmer on whose swede crop the trials were made, that he invited his neighbours to look at the plots. The visitors, many of whom had crops suffering from Flea Beetle attack, were keenly interested and expressed themselves as being "fair capped" by the appearance of the dusted plots. The differences between the treated and untreated plots were maintained, and by thinning time it was estimated that plants in the dusted drills had approximately four times as much leaf surface as the surviving plants in the untreated drills.

Trials on Brussels Sprouts Seedlings.—At a second centre, near Cartmel, a field devoted to market garden crops was found to be heavily infested with Flea Beetles that were attacking the brussels sprouts seedlings. The seed was drilled on May 4, and by May 21 the seedlings were through the ground and suffering severely from attack by Flea Beetles. Certain rows were dusted with the naphthalene-silica dust, already described, on May 22, May 28, and June 3. By June 10, it was apparent that the treatment had succeeded in protecting the seedlings, although the results were less spectacular than in the preceding trial, where the dust was first applied when the seedlings were just breaking the ground. The following table shows the numbers of seedlings per yard length of drill on both treated and untreated plots.

CONTROL OF FLEA BEETLES

TABLE III.

<i>Yard lengths.</i> No. 1	<i>No. of plants established.</i>	
	<i>Dusted drills.</i>	<i>Untreated drills.</i>
2	7	6
3	13	7
4	21	0
5	12	13
6	6	4
7	21	0
8	6	4
9	16	8
10	12	10
10	16	4
Average	13.0	5.6

From these figures, it can be seen that there were more than twice as many seedlings on the dusted plots as on the untreated plots. In the untreated drills, the seedlings were badly injured by the Flea Beetles and had less than a quarter of the amount of leaf surface possessed by the treated seedlings, which were all larger and stronger plants. On this holding the plants were allowed to develop in their seedling drills, the surplus plants being thinned out for use elsewhere. Thus the advantages derived from the treatment were apparent at maturity, the plants on the dusted drills being quite a third taller than those on the untreated drills, having larger and stronger foliage, and producing a correspondingly heavier crop.

Conclusion.—Experiments, under field conditions, in the north-west of England have shown that a naphthalene-silica dust, applied at the rate of about 55 lb. per acre, at the time seedlings of swedes and other *Brassicae* are breaking through the soil, will give adequate protection against Flea Beetles. Though early application is to be recommended in order to obtain the best results, some benefits may be obtained by later dustings and sufficient plants saved to render re-seeding unnecessary. Application of the dust by means of a knapsack duster appears quite practical; and, under normal conditions, two men can dust an acre in about an hour and a half.

MARKETING NOTES

Milk Marketing Scheme.—Regional Pool Prices for December, 1934.—The wholesale contract price for December under the English Milk Marketing Scheme was 1s. 5d. per gallon in all regions, the price being 1d. higher than in November. Pool prices and rates of producer-retailers' contributions fixed by the Board for December are given below, with comparative figures for the previous month:—

Region	Pool Price (Pence per gallon)		Producer-Retailers' Contributions (Pence per gallon)	
	Nov.	Dec.	Nov.	Dec.
Northern	14	14½	1½	2½ ⁷ / ₈
North-Western	14	14½	1½	2½ ⁷ / ₈
Eastern ..	14½	14½	1½	2½
East Midland	14	14½	1½	2½
West Midland	13	14	2½	2½ ⁷ / ₈
North Wales	13½	14	2½ ⁵ / ₈	2½ ⁷ / ₈
South Wales	14	14½	1½	2½
Southern	14½	14½	1½	2½ ⁷ / ₈
Mid-Western	13	14½	2½	2½ ⁷ / ₈
Far-Western	13	14	2½	2½ ⁷ / ₈
South-Eastern	14½	14½	1	2½ ¹ / ₄
Unweighted Average	13.80	14.34	1.85	2.37

Producer-retailers who did not sell milk by wholesale during the month otherwise than on contracts carrying level-delivery premiums were credited with a level-delivery premium of ½d. a gal.

The inter-regional compensation levy was fixed at 1½d. per gal. on all liquid sales, instead of 1d. per gal. as in the previous month. The proceeds were distributed in full among the regional pools in proportion to the milk sold in each region for manufacturing purposes. A levy of ¼d. per gal. was made for expenses, liabilities and reserves.

The estimated sales under contract for the month were 62,911,626 gal., compared with 60,284,234 gal. in November. Liquid sales (45,158,478 gal.) showed an increase of approximately 775,813 gal., and manufacturing sales (17,753,148 gal.) an increase of 1,851,579 gal. compared with November. The proportion sold for manufacture constituted 28.2 per cent. of total sales compared with 26.4 per cent. in November.

Milk manufactured into cheese by farmhouse cheese-makers fell from 305,869 gal. in November to 252,209 gal. in December.

MARKETING NOTES

At the end of December, 1934, the numbers of registered wholesale contracts and producer-retailers' licences stood at 83,700 and 69,500 respectively, compared with 76,600 contracts and 53,800 licences at the end of December, 1933. The quantities of milk sold under the wholesale contracts and average prices, together with the average pool prices and producer-retailers' contributions, during the three months ended December 31, 1934, compared with the corresponding period in 1933 are as follows:—

	October 6* to December 31, 1933	October 1 to December 31, 1934
	<i>gal.</i>	<i>gal.</i>
Liquid Milk... ..	125,009,888	136,184,389
Milk utilized in manufacture ...	24,940,092	50,485,173
TOTAL	149,949,980	186,669,562
Average Contract Price for Liquid Milk—	<i>d.</i>	<i>d.</i>
South-Eastern Region	16'33	16'33
Other Regions	15'66	16'33
Average Realization Price for Manu- facturing Milk	5'65	6'35†
Average Pool Price	13'94	13'90
Average Producer-Retailers' Contribution	1'59	2'11

* The Scheme came into full operation on this date.

† Includes repayable advances under the Milk Act, 1934.

Demand for Poll of Producers.—Consideration has been given by the Milk Marketing Board to a petition signed by 545 registered producers asking for a poll to be taken on the question whether the Milk Marketing Scheme, 1933, should be revoked. Under the Agricultural Marketing Act, 1931, the consent of the Board is necessary before such a poll can be taken within a period of two years from the date of the declaration of the result of the initial poll on the Scheme, i.e., before September 6, 1935. In announcing their decision not to accede to the request for a poll, the Board stated that they were influenced by the Government's intention to appoint a Milk Reorganization Commission for Great Britain, and by the fact that a Sub-Committee of the Board are now examining the working of the Scheme in the light of the twelve months' experience now gained, with the aim of amending it in certain directions.

Potato Marketing Scheme.—The Board have decided that the riddle regulations made on December 6, 1934, and

MARKETING NOTES

noted in last month's JOURNAL, shall continue in force until February 12, subject to one small adjustment in the boundaries of the areas.

Registered producers have been reminded that, if they intend to plant with potatoes in 1935 a greater acreage of land in their occupation than they had under potatoes in 1934, they must notify the Board in writing of their intention before they begin to plant. Registered producers have also been reminded that they will be liable to pay to the Board a special contribution, not exceeding £5 per acre, in respect of any excess acreage, if, at the proper time, the Board so decide.

A second list of authorized merchants has now been issued. Some late applications for authorization still remain to be considered.

Pigs and Bacon Marketing Schemes: *Price of Bacon Pigs for January.*—The price of the "basic" pig (Class 1, Grade C) for January—the first month under the new contract terms—was 11s. 3d. per score compared with 12s. 1d. for December. In addition, producers will receive 1d. per score as a contribution towards insurance. Moreover, producers of all pigs delivered and accepted under contract, except those delivered under supplementary contracts, will later receive a bonus, provided that the total number of pigs delivered by each producer and accepted in the months January to April amounts to at least 25 per cent. of the number contracted for by that producer over the year, excluding pigs contracted for under supplementary contracts.

Bacon Supply Arrangements for 1935—Great Britain.—As a result of the extension of the contracting period to December 22, referred to in the JOURNAL for December, 1934, supplementary contracts were obtained by the Pigs Marketing Board for a further 100,000 pigs, making approximately 1,800,000 in all. Although this was a substantial increase on the rate of contracting in the previous contract period, it fell considerably short of the number considered by the Bacon Marketing Board, in view of the uneven distribution of contracts, to be necessary to give an economic throughput to the curing industry. Following negotiations between the two Boards, however, the Pigs Marketing Board have announced that all contracts for 1935 have been confirmed and it is understood

MARKETING NOTES

that the Boards have under consideration the question of the means to be adopted for augmenting the supply of pigs during the last eight months of the year.

Infringement of Bacon Marketing Scheme.—The Bacon Marketing Board on January 10, 1935, imposed a fine of £50 1s. on a registered bacon curer for a contravention of paragraph 37 of the Bacon Marketing Scheme, which prohibits a registered curer from selling bacon which has not been manufactured from pigs or carcasses bought by him from certain specified sources. Under paragraph 38 (3) of the Bacon Marketing Scheme, the Bacon Board are required in such cases to impose and recover such penalty, not exceeding £100 plus half the price for which the bacon was sold, as they think just.

Pig Contracts in Northern Ireland.—The Northern Ireland Pigs Marketing Board have recently prescribed a form of contract for the sale of pigs for Wiltshire cure. This follows fairly closely the lines of the Great Britain contract.

The contract is for monthly deliveries, over periods of not less than three months, of live pigs of Large White Yorkshire type, between 126 lb. and 189 lb. dead weight, with a 20 per cent. monthly tolerance and a 10 per cent. tolerance on deliveries over the whole contract. The price to be paid is 3s. per cwt. (about 6½d. per score) below the Great Britain contract price for a "basic" pig. Three grades are defined, the standard price applying to Grade 2; a premium of 4s per cwt. (9d. per score) is paid on Grade 1, and a deduction of like amount is made on Grade 3 pigs. Grading and weighing will be done by officials of the Ministry of Agriculture for Northern Ireland.

Transport is paid by the curer from the producer's nearest station, but a producer may have his pigs collected by the curer, if within 15 miles of the factory, at a cost of 4d. per pig. A deduction of 4d. per pig is made to cover insurance.

The penalty for wilful or negligent default is £1 per pig, but, as in Great Britain, the producer is safeguarded against penalization for unavoidable default. The curer must also pay a penalty of £1 per pig if he wilfully or negligently fails to accept the number of pigs he has contracted to buy.

All contracts must be registered with the Pigs Board,

MARKETING NOTES

whose agents or officers may enter curers' factories to watch producers' interests or investigate complaints.

A system of group contracts for small producers is being worked out.

The contract system is an innovation in Northern Ireland: curers are not, however, as in Great Britain, required to buy all their pigs on contract, and producers are free to sell dead pigs to curers, if they wish, without contracts, though only at the prices prescribed by the Northern Ireland Pigs Board. Pigs sold alive must, however, be sold either through the Pigs Board or on a contract to a curer.

Bacon Supplies in 1934.—The Lane-Fox Commission recommended the stabilization of total annual bacon supplies in the United Kingdom at the average of the years 1925-30, viz., about 10,670,000 cwt.

The following table shows the supplies of bacon (including salted pork and tinned hams) that were available from all sources for consumption in the United Kingdom each month in 1934:—

	Great Britain Output			Northern Ireland Output	Net Imports†	TOTAL
	From home pigs	From imported pigs and car- casses*	TOTAL			
	<i>cwt.</i>	<i>cwt.</i>	<i>cwt.</i>	<i>cwt.</i>	<i>cwt.</i>	<i>cwt.</i>
January ..	108,162	17,801	125,963	33,048	685,046	844,057
February ...	95,404	21,960	117,364	32,539	655,522	805,425
March ...	86,865	21,883	108,748	29,196	715,405	853,349
April ...	88,597	18,506	107,103	34,186	748,800	890,089
May ...	107,650	18,944	126,594	33,902	775,543	936,039
June ...	115,601	20,372	135,973	45,079	695,735	876,787
July ...	116,441	22,301	138,742	31,959	794,717	965,418
August ...	152,877	28,729	181,606	43,592	716,771	941,969
September...	175,090	21,330	196,420	54,800	624,964	876,184
October ...	200,914	22,436	223,350	57,143	634,895	915,388
November...	183,625	19,555	203,180	58,298	663,359	924,837
December‡	136,529	17,007	153,536	34,362	668,345	856,243
	1,567,755	250,824	1,818,579	488,104	8,379,102	10,685,785

* Including Northern Ireland pigs exported to Great Britain.

† Imports minus re-exports.

‡ Provisional figures.

Total supplies amounted to 10,686,000 cwt. compared with the figure of 10,670,000 cwt. recommended by the Lane-Fox Commission, to which has to be added a small

MARKETING NOTES

allowance in respect of tinned hams, salted pork and the output of small curers in this country, which were not included in the Commission's calculation.

Bacon Import Arrangements for 1935.—In view of the decision, referred to above,* to permit supplementary contracts for bacon pigs, import allocations to foreign countries have been made, in the first instance, in respect of the months January to April, 1935. Allocations for the last eight months of the year will be determined later in the light of the final home contract position.

Taking into account an anticipated increase in supplies from Northern Ireland and the Dominions, together with probable home output on the basis of contracts, the total foreign quota for the first four months of 1935 was fixed at a rate representing a reduction of just under 4 per cent. on the rate prevailing in the last five months of 1934.

The allocations to the individual foreign exporting countries for the four months are as follows:—

<i>Country.</i>	<i>Allocations</i>	
	<i>Jan.-Apr., 1935 (a)</i>	
	<i>cwt.</i>	
Denmark	1,250,394	(b)
Netherlands	175,098	
Poland	146,530	
Sweden	86,628	
Lithuania	54,373	
Estonia	13,823	
Finland	7,372	
Latvia	12,902	
U.S.S.R.	15,667	
Argentina	12,902	
U.S.A.	147,451	
Allowance for imports from foreign countries not scheduled to the Bacon (Import Regulation) Order	44,593	
Total ..	1,967,733	

(a) Subject to deduction, in the case of certain countries, in respect of over-shipments in previous periods.

(b) Of this allocation, a quantity of 80,000 cwt. is on account of adjustments due in respect of deficiencies in imports from Denmark in previous periods, below the minimum of 62 per cent. of permitted foreign imports guaranteed to that country under the Anglo-Danish Trade Agreement.

Bacon Imports Administration.—One of the conditions on which certificates issued by foreign bacon-exporting countries are permitted to have effect as import licences,

* See page 1086.

MARKETING NOTES

under the Bacon (Import Regulation) Order, is the acceptance of a Form of Arrangement embodying rules to be observed for the purposes of quota administration. This Form of Arrangement has hitherto provided for the sub-division of the bacon allocations of the main exporting countries into four-weekly parts and for the observance of these four-weekly sub-allocations within a tolerance of 5 per cent. In order to reduce short-period variations in bacon supplies and thus increase market stability, it has been considered desirable to modify the Form of Arrangement in certain respects, particularly as regards sub-allocation periods and tolerances. Accordingly, as from January 1, 1935, the allocations of the main exporting countries have been sub-divided into fortnightly parts and the countries concerned will be required to adhere to these sub-allocations within a tolerance of $2\frac{1}{2}$ per cent. Any excess of imports over allocation in any fortnightly period is to be offset within the next two fortnightly periods.

Cattle (Import Regulation) Order, 1933. — The circumstances leading up to the issue by the Board of Trade of the Cattle (Import Regulation) Order, 1933, under Section 1 of the Agricultural Marketing Act, 1933, were briefly stated in an announcement on the live-stock situation made by the Minister of Agriculture and Fisheries in the House of Commons on December 20, 1933, the text of which was given in the January, 1934, issue of this JOURNAL (pp. 959-961). A brief description of the Order was given in the same issue (p. 906). It prohibits the importation into the United Kingdom from the Irish Free State, of beef and veal and edible beef and veal offals, and, except under licence, of certain classes of cattle.

During each quarter of 1934 licences under the Order were issued by the Board of Trade on the basis of 50 per cent. of the numbers of fat cattle, and 100 per cent. of the numbers of store cattle and of bulls showing permanent incisor teeth, and dry cows, imported in the corresponding quarter of 1933. Imports of other classes of cattle, viz., cows in milk, cows and heifers in an advanced state of pregnancy, and calves under six months old, are not regulated under the Order.

The following table shows imports into the United Kingdom from the Irish Free State, of cattle of the three

MARKETING NOTES

regulated classes in each month of 1934 as compared with imports in the corresponding months of 1933:—

Month	Fat Cattle		Store Cattle		Bulls & Dry Cows for slaughter	
	1933	1934	1933	1934	1933	1934
January ...	17,106	7,232	16,315	29,310	4,219	1,361
February ...	13,321	5,845	26,033	26,837		1,127
March ...	15,721	7,084	45,720	30,815	1,979	1,482
April ...	11,070	4,220	36,297	27,239		878
May ...	7,535	4,296	31,393	25,848	2,609	617
June ...	6,143	3,475	7,797	18,775		615
July ...	10,868	5,241	3,738	8,710	5,177	791
August...	24,881	13,272	6,771	8,551		917
September ...	26,427	13,048	17,948	16,687	1,511	914
October ...	32,747	16,099	54,984	46,996		1,511
November ...	35,307	16,085	52,955	48,166	1,594	1,594
December ...	21,402	12,039	18,009	26,308		1,785
Total ...	222,528	107,936	317,960	314,242	13,984	13,592

The arrangements for regulating imports of cattle into the United Kingdom from the Irish Free State in 1935 were indicated in the following statement issued on behalf of the Secretary of State for Dominion Affairs on January 3:—

“ As the result of discussions during the last few weeks, an informal understanding has been reached on the subject of exports of coal from the United Kingdom to the Irish Free State and of cattle from the Irish Free State to the United Kingdom.

As regards coal, it is anticipated that in future all imports into the Irish Free State will be purchased in the United Kingdom. This will mean an increase in coal exports from the United Kingdom to the Irish Free State of approximately $1\frac{1}{4}$ million tons a year, representing the full employment of about 5,000 miners. The coal producing districts which will secure the main benefit from this arrangement are those which have benefited least from the Scandinavian Trade Agreements, namely, South Wales, North Wales, Lancashire, Cumberland and the West Coast of Scotland.

As regards cattle, the position has been considered in relation to arrangements for the assistance of the home live-stock industry after the expiration on March 31 next of the Cattle Industry (Emergency Provisions) Act, 1934. Whilst the regulation of cattle imports from the Irish Free State is being continued on existing lines, provision is being made for the numbers of cattle admitted into the United Kingdom during 1935 to be, in the case of fat cattle, at the rate of 66½ per cent. of 1933 quantities and, in the case of other regulated classes of cattle, a figure approximating to the average for years 1930 to 1932.”

The average of the numbers of “ other regulated classes of cattle,” viz., store cattle, and bulls and dry cows for slaughter, imported in the years 1930 to 1932, is approximately 437,000.

MARKETING NOTES

Regulation of Meat Imports, January—March, 1935.

—Arrangements have been completed for the regulation of imports of beef and veal, mutton and lamb, and of frozen pork, into the United Kingdom during the first three months of 1935. As regards foreign sources of supply, imports of chilled beef will stand at the level of 90 per cent. and imports of frozen carcass and boned beef and of mutton and lamb at 65 per cent., of the quantities imported in the corresponding quarter of the Ottawa year. Arrangements are being made with the object of reducing imports of frozen pork to the average of imports in the first quarter of the years 1932, 1933 and 1934, and all imports of canned beef from foreign sources to a quantity not exceeding one-fourth of those imported in the year 1933.

As regards supplies of meat from overseas Empire countries agreement has been reached with the Governments of all the countries concerned on a programme based, in the case of the principal sources of supply, on the average of the quantities imported in the first quarters of the years 1932, 1933 and 1934. The programme provides for the importation of the following supplies of dead meat from the Dominions and Southern Rhodesia :—

	<i>Beef and Veal</i> ooo cwt	<i>Mutton and Lamb</i> ooo cwt	<i>Pork.</i> ooo cwt
Australia	187	450	16 7
New Zealand	160	800	75
Canada	19 25	—	8 6
Union of South Africa	17	—	—
Southern Rhodesia	51	—	—
Total	434 25	1,250	100 3

The figures for frozen pork are exclusive of pork for curing in this country, imports of which have been dealt with separately under the arrangements for the regulation of bacon supplies.

The Cattle Fund.—By January 10, 1935, £1,166,250 had been paid to producers of certain classes of fat cattle in Great Britain and Northern Ireland under the Cattle Industry (Emergency Provisions) Act, 1934. These payments were in respect of 488,400 animals, the average payment per animal being £2 7s. 9d.

Killing-out Percentage.—Regulations, dated December 20, 1934, have been made by the Minister and the Secretaries of State concerned with agriculture in Scotland and Northern Ireland, amending, with effect from January 1, 1935, the

MARKETING NOTES

killing-out percentage to which cattle, in respect of which payments may be made under the Act, must conform.

The standard is raised from 52 per cent. to 54 per cent., that is to say, the weight of the dressed carcass as estimated by the Certifying Authority must be in the proportion of 60 lb. (instead of 58 lb.) to each hundredweight of the live weight of the animal.

Milk Act, 1934.—Advances amounting to £595,698 have to date been made to the Milk Marketing Board under Section 1 of this Act in respect of milk used for manufacture (excluding milk manufactured by the Board itself or milk used for cheese-making on farms). Details are given below :—

Month in which milk was produced and manufactured	Gallons of milk used	Product	† Rate at which advances were made	Amount of advance
* April to Sept.	79,451,634	Butter, Cheese, Milk Powder, Condensed Milk for Export, and Tinned Cream	Varying from 2'28d. to 2'25d. according to product and month	£ s. d. 426,940 12 2
October ...	10,454,952			94,391 14 9
November	9,444,623			74,366 2 8
Totals	99,351,209	—	—	595,698 9 7

* For monthly details, see January JOURNAL.

† Difference between the net cost per gallon to the purchaser of the milk or the cheese-milk price (whichever is the greater) and the standard price, which is 5d. per gallon in the summer months and 6d. per gallon from October to March, inclusive.

A first payment of £48,351 has been made to the Board under Section 3 of the Act in respect of milk manufactured into cheese on farms, details of which are as follows :—

Month in which milk was produced and manufactured	Gallons of milk used	Cheese-Milk price	* Rate of payment per gallon	Amount of Advance
1934		d.	d.	£ s. d.
April ...	1,720,683	3.42	1.58	11,327 16 7
May ...	2,566,178	3.40	1.60	17,107 17 1
June ...	2,095,812	3.48	1.52	13,273 9 6
July ...	1,115,394	3.75	1.25	5,809 6 10
August...	170,821	3.83	1.17	832 15 1
Totals ...	7,668,888	—	—	48,351 5 1

* Difference between cheese-milk price and standard price of 5d. for the summer months.

MARKETING NOTES

Under Section 6 of the Act, a sum of £100,071 has, by direction of the Treasury, been paid to date by the Ministry to the Government of Northern Ireland with the object of securing a standard price for milk manufactured in Northern Ireland into cream and butter. This sum is made up as follows:—

Month of manufacture	Gallons of Milk used for cream and butter	Average price paid to suppliers per gallon	Equalization payment per gallon	Equalization payment		
		<i>d.</i>	<i>d.</i>	£	<i>s.</i>	<i>d.</i>
April ...	755,877	3·7	1·3	4,094	6	6
May ...	1,400,137	3·3	1·7	9,917	12	11
June ...	2,530,820	3·0	2·0	21,090	3	4
July —	2,713,384	2·8	2·2	24,872	13	7
August ..	2,649,008	2·9	2·1	23,178	15	11
September ...	1,951,989	2·92	2·08	16,917	4	9
	12,001,215	—	—	100,070	17	0

Milk for Schools.—During November, 1934, 2,309,000 gallons of milk were consumed in schools under the scheme assisted by the Government under Section 11 of the Milk Act. This indicates that nearly two and a half million children were receiving milk in schools during that month.

Cheese-Milk Price.—For the purpose of Exchequer advances under the first three sections of the Milk Act in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 3·93*d.* per lb. for the month of January, 1935.

Nutritional Survey.—A sub-Committee of the Milk Marketing Board's Advisory Committee on Milk Publicity is framing a scheme for investigating the nutritional value of milk in connexion particularly with schemes for the supply of milk at reduced rates which are now or may hereafter be in operation.

Wheat Act, 1932: Sales of Home-grown Wheat.—Certificates lodged with the Wheat Commission by registered growers during the period from August 1, 1934, to January 4, 1935, cover sales of 18,195,034 cwt. of millable wheat. The total sales to the corresponding date (January 6) last year, amounted to 15,452,834 cwt.

Authorized Merchants.—The Wheat Commission have recently called attention to the responsibilities of authorized

MARKETING NOTES

merchants in regard to the examination of wheat and the issue of Wheat Certificates under the Wheat Act, 1932. The Commission have issued a "Handbook of Directions to Authorized Merchants," embodying explanations and directions issued by the Commission from time to time.

Beet Sugar : Production of Home-Grown Beet Sugar.—Returns furnished by the beet sugar factories operating in Great Britain show that the total quantities of beet sugar manufactured during December, 1934, and the corresponding month of 1933 were:—

1934	..	..	2,971,664 cwt
1933	..	..	2,338,246 cwt.

The total quantities produced during each manufacturing campaign up to the end of December, were:—

1934-5 campaign	..	..	9,827,530 cwt.
1933-4 campaign	..	..	7,874,981 cwt.

The condition of the 1934-35 sugar crop continues to be satisfactory. Favourable climatic conditions have influenced the weight of roots, and it is expected that the yield per acre will be above the average. The campaign is nearing its close; the majority of the factories will have completed operations by the end of January.

Molasses Subsidy.—In accordance with the schedule to the British Sugar (Subsidy) Act, 1934, the Minister, after consultation with the Treasury, has made the British Sugar (Subsidy) Rules, 1934, for determining and certifying the average market price of raw sugar for the purpose of calculating the subsidy payable in respect of molasses manufactured from home-grown beet between August 31, 1934, and September 1, 1935. The average market price of raw cane sugar for the last thirteen weeks of 1934 has been certified at 4s. 2.9d. per cwt. As the certified price is less than 5s. 6d. per cwt., subsidy is payable in respect of molasses produced in the 1934/35 campaign at the rates shown in the Schedule to the British Sugar (Subsidy) Act, 1925.

Fat Stock: Carcass Sales by Grade and Dead Weight—Sales of fat stock by grade and dead-weight, under the facilities provided by the Ministry, made satisfactory progress during the year 1934. In the 12 months ended December 31, 7,243 cattle, 21,108 lambs and sheep, and 1,489 pork pigs were dealt with at the grading centres, com-

MARKETING NOTES

pared with 2,448 cattle, 16,968 lambs and sheep, and 20 pork pigs received during 1933.

The total numbers of stock dealt with under the Scheme to December 31, 1934, are 11,258 cattle, 38,076 lambs and sheep and 1,515 pork pigs.

The following table shows the grading of the carcasses dealt with in 1934:—

	Carcass Grade				Un-graded	Total
	Super*	I	II	III		
<i>Cattle</i>						
Bullocks and Heifers	22	1,672	5,877	1,202	247	7,020
Other Classes ..	—	66	95	39	23	223
<i>Sheep</i>						
Lambs	—	5,927	8,261	2,492	918	17,598
Other Sheep .	—	1,370	1,551	431	158	3,510
<i>Pigs</i>						
Pork Pigs and Sows	—	722	676	74	17	1,489

* This grade is for bullocks and heifers only.

The numbers of stock dealt with at the different centres were as follows:—

	<i>Cattle.</i>	<i>Sheep.</i>	<i>Pigs.</i>
Birmingham . . .	3,691	12,780	281
London	939	2,644	382
Leeds Area	925	2,168	195
Liverpool Area . .	1,472	2,559	575
Manchester	196	957	44
Sheffield	20	—	12

Birmingham, a large consuming area, centrally situated in relation to important producing areas, handled most of the stock.

London showed an increase of about 100 per cent. compared with 1933; most of this increase occurred in the last four months of the year.

The figures for the Leeds area are noteworthy, as no cattle and only 623 sheep were dealt with in 1933.

The centres at Manchester and Sheffield were opened on September 1, 1934, with the coming into force of the Cattle (Emergency Provisions) Act, 1934.

Apart from the increase in the numbers of stock handled during the year, it should be mentioned that some of the most important producers in the country consistently make use of this alternative method of marketing their stock.

MARKETING NOTES

The reactions in the wholesale markets are interesting, because this method of marketing stock tends to eliminate sales on commission. This helps to promote price stabilization, and the effect is in direct proportion to the number of stock sold by grade and dead-weight compared with the total market supplies.

The beneficial effects of this scheme to the producers cannot be gauged solely on the numbers of stock handled, because there is ample evidence that the existence of this alternative market has had the effect of raising local prices in areas where producers are well acquainted with the scheme.

The schemes are in operation at London, Birmingham, Leeds, Halifax, Bradford, Manchester, Liverpool and Sheffield. The Ministry's Meat Graders at these centres are the Certifying Officers in respect of Cattle Fund payments based on the carcass weight.

National Mark Beef.—The number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during October, November and December, 1933 and 1934, and the three weeks ended January 19, 1935, were as follows:—

LONDON AREA.				
	<i>Home Killed</i>	<i>Scotch Sides for London.</i>	<i>Scotch Sides marked at Smithfield.</i>	<i>Total.</i>
Oct., 1933	11,246	5,178	—	16,424
„ 1934	9,654	6,648	—	16,302
Nov., 1933	10,515	4,615	—	15,130
„ 1934	9,066	6,239	—	15,305
Dec., 1933	10,898	5,800	—	16,698
„ 1934	10,956	7,307	—	18,263
Three weeks ended Jan. 19, 1935	7,249	5,194	—	12,443

				BIRKENHEAD AREA. (Including Liverpool.)	
	<i>For London (included under Home-Killed in London Area).</i>	<i>Liverpool (for local requirements).</i>			<i>Total.</i>
Oct., 1933	4,529	—			4,529
„ 1934	3,115	1,508			4,623
Nov., 1933	4,008	—			4,008
„ 1934	2,950	1,546			4,496
Dec., 1933	3,997	—			3,997
„ 1934	3,381	1,576			4,957
Three weeks ended Jan. 19, 1935	1,853	1,129			2,982

MARKETING NOTES

BIRMINGHAM AND YORKSHIRE AREAS.

	<i>Birmingham.</i>	<i>Leeds.</i>	<i>Bradford.</i>	<i>Halifax.</i>
Oct., 1933 ..	5,186	2,440	2,050	606
" 1934 ..	5,293	2,533	1,898	553
Nov., 1933 ..	5,337	2,233	1,641	429
" 1934 ..	5,152	2,259	1,536	455
Dec., 1933 ..	5,100	1,891	1,389	399
" 1934 ..	5,144	2,204	1,701	491
Three weeks ended				
Jan. 19, 1935 ..	3,570	1,686	1,177	327

During the year ended December 31, 1934, a total of 222,799 home-killed sides and 74,991 Scotch-killed sides of beef were graded and marked with the National Mark. The total number of sides graded and marked at all centres from the commencement of the scheme in October, 1929, to the end of last year exceeded 1,390,939.

National Mark Stilton Cheese.—The Agricultural Produce (Grading and Marking) (Stilton Cheese) Regulations, 1934, were made on December 10, 1934, thus enabling the National Mark to appear on graded Stilton cheese consigned for the Christmas trade.

Eleven makers, including some of the largest in the country, have been authorized in the National Mark Stilton Cheese Scheme.

National Mark Cheshire Cheese.—The output of National Mark Cheshire Cheese for the last quarter ended December 31, 1934, was as follows:—

I.—FARM CHEESE.

No. of packers who submitted cheese for grading	No. of Cheese Graded		
	Extra	Selected	Total
197	4,967	15,879	20,846

II.—FACTORY CHEESE.

4,124 Cheshire Cheeses, weighing 1,649 cwt. were graded and marked on the premises of five of the authorized manufacturers.

Investigations are proceeding with the object of introducing National Mark schemes for a number of the other more important types of English cheese during the current year.

British Industries Fair.—The Ministry is arranging to stage an exhibition of National Mark products at the British Industries Fair, which is to be held at Olympia from

MARKETING NOTES

February 18 to March 1. The exhibits will include canned and bottled fruit and vegetables, honey, jam, Cheshire and Stilton cheese, creamery butter and such fresh fruits and vegetables as are in season.

South London Exhibition.—England and Wales will be represented in the Empire Section of this exhibition; a stand is being arranged by the Ministry to display National Mark products. Demonstrations of the grading and packing of National Mark eggs will be given daily during the exhibition, which is to be held at the Crystal Palace from March 6 to 16.

Canada : Marketing Schemes.—The Canadian Natural Products Marketing Act, 1934, an enabling Act somewhat similar in scope to the agricultural marketing legislation of this country, became law in July, 1934. Notes on the principal provisions of the Bill and the Act appeared in this JOURNAL in June, 1934 (p. 284) and October, 1934 (p. 685).

Schemes under the Act may exercise control over producers in the Dominion only in so far as they sell outside their own Province, since the marketing of natural products within the province of origin is excluded from the scope of the Act and can only be made subject to regulation by virtue of provincial legislation constituting provincial boards. The Dominion Marketing Board may, however, take powers conferred upon it by, or pursuant to, provincial legislation, or may act jointly with any such provincial board in the marketing of any natural product.

Where a scheme involves the imposition of levies, the Dominion Marketing Board may, under powers conferred by provincial legislation, or in co-operation with a provincial board, impose levies on inter-provincial marketing, and may authorize the provincial board to collect and disburse the money so raised or to utilize it for administrative purposes. A provincial board may also, under the supervision of the Dominion Marketing Board, be authorized to act as a "local board" under the Dominion Act if the "area" of the scheme is confined within the limits of the province.

Most of the provincial governments have already passed enabling legislation providing for the establishment of provincial or local boards to function either under the Dominion statute or under the provincial measures, and authorizing such boards to act as agents for, and to co-operate with, the Dominion Marketing Board.

A number of schemes under the Act have been submitted to the Dominion Marketing Board for consideration, and the following five schemes have already been approved by Orders in Council of the dates shown:—

- (i) Tree Fruits Marketing Scheme (August 25, 1934),
British Columbia.
- (ii) Fruit Export Marketing Scheme (August 30, 1934),
Dominion.
- (iii) Western Red Cedar Shingles Export Scheme
(October 12, 1934), *British Columbia.*
- (iv) Dry Salt Herring and Dry Salt Salmon Marketing Scheme
(October 20, 1934), *British Columbia.*
- (v) Flue-Cured Tobacco Marketing Scheme (October 26, 1934),
Ontario.

MARKETING NOTES

Three of these schemes relate, respectively, to the sale of tree fruits produced in a defined area of British Columbia, of dry salt herring and dry salt salmon produced in the province of British Columbia, and of flue-cured tobacco produced in Ontario. The other two are designed to regulate, respectively, the export of apples and pears from the Dominion, and the export to the United States of red cedar shingles which are the product of British Columbia. The following notes describe briefly the provisions of one of the schemes in each of these two groups.

The British Columbia Tree Fruit Marketing Scheme regulates the marketing of tree fruits produced in the chief fruit-growing areas of British Columbia. A poll of registered growers is to be taken before March 31, 1935, to determine their wishes as to the continuation of the scheme.

A provisional board has been constituted to function until the appointment of the permanent Local Board. The provisional board is to register all growers of tree fruits in the regulated area, to define local districts and to call a meeting of growers in each district. Each registered grower is to have one vote for the appointment from his district of a delegate to the election convention. At the election convention, each delegate is to have one vote on behalf of each registered grower in his district in the election of three registered growers to form the Local Board. The candidate receiving the highest number of votes is to become chairman, and the two next highest will be the other two members of the Board. This basis of representation may be amended at the discretion of the Dominion Marketing Board. The election convention is to be held annually.

The Local Board may regulate the time and place of marketing, the manner of distribution, and the quantity, variety, grade and size of any regulated product marketed; but the provisions of the Fruit and Honey Act, 1934, which deals with grading and packing, and the regulations made thereunder, are to remain operative. The Board may also designate the agency through which a regulated product shall be marketed; but in the exercise of this power there must be no discrimination against any established marketing agency which complies fully with the requirements of the scheme. The Board have power even to prohibit the marketing of a regulated product.

The Board may co-operate with, or act as agent for, any board established under the Act or under the law of any province in conformity with the Act. The Board may also exercise powers delegated to it by the Dominion Marketing Board. Copies of all minutes and regulations are to be forwarded to the Dominion Marketing Board.

Power is given for the licensing of "shippers" by the Board. A "shipper" is defined as a person who markets a regulated product. Such licences are subject to cancellation, and the Board has power to appoint a deputy, at a fixed rate of remuneration for marketing expenses, to market the regulated products controlled by any shipper whose licence is cancelled. The Board may require registered growers to market their tree fruits only through licensed shippers. Information may be required, from time to time, from such shippers and growers as to present and estimated future supplies.

The views of shippers as to the policy of the Board are to be represented by a Shippers' Advisory Council, consisting of four persons engaged in the marketing of tree fruits, one of whom is to be appointed by the Associated Growers of British Columbia, one by the Grower-Shippers' Association, and two by shippers not affiliated to either association.

Power is given for the pooling of the proceeds of shippers' sales of any regulated product or group of regulated products marketed within Canada, and this provision may be applied either generally or to a particular locality within the regulated area. Where pooling takes place, the contributions of shippers are to be on a fixed price basis,

MARKETING NOTES

and any sums received by a shipper in excess of the fixed price are to be retained by him. The Board may, in respect of any pooled fruit, determine the amount of any storage, transportation, handling, brokerage or other charge, any loss through shrinkage, or any marketing rebate, adjustment or allowance, and may, by means of special levies and bounties, operate equalization funds.

Charges may be levied upon licensed shippers in respect of the whole or any part of a regulated product, up to a maximum of \$0.02 per box of apples (proportionate rates for other fruit to be fixed by the Board) to meet the Board's expenses and for the creation of reserves. The Board has power to borrow money, but its indebtedness for loans must not exceed \$15,000. In the event of winding-up, the outstanding assets are to be distributed to shippers in proportion to their contributions to the funds during the last season's operations.

Returns and other information may be required from registered growers and licensed shippers, and, on the authority of the shipper concerned, from transporters of any regulated product. The Board or its agent may inspect the premises and records of shippers, as well as the lands of registered growers.

The Dominion Fruit Export Marketing Scheme regulates the marketing of all apples and pears intended for export. A provisional board has been constituted pending the appointment of the permanent "Export Local Board." The permanent Board is to consist of four persons appointed by the producers of the fruit-exporting provinces, two for Nova Scotia, one for Ontario, and one for British Columbia, and these members are to appoint annually a further member to act as chairman. The representatives of the provinces are to be elected by the provincial fruit board, if one has been formed, or if not, by the voting of local producers of not less than 750 standard boxes of fruit or 200 standard barrels in any one of the previous three years. Copies of all minutes and regulations and of the annual report and statement of accounts are to be sent to the Dominion Marketing Board.

The Export Local Board is empowered, subject to the provisions of the Act, to regulate the movement of fruit shipped or exported from Canada and to require that fruit in any quantity, and of any size or quality, and during any period, shall not be exported. The Board has power to require all producers engaged in the production of fruit in Canada to register, and to require all persons engaged in the export of fruit to obtain a licence. The Board may demand full information relating to the production and export of fruit.

The Board also has power to make levies in respect of fruit marketed outside Canada, up to a maximum of one cent per barrel or one-half cent per smaller package, and to utilize the proceeds in meeting its expenses. The provincial fruit boards (or, where there is no provincial board, some other authorized producers' organization) are made jointly responsible for supervising the Export Local Board's administration of the funds, and for fixing the salaries of members of the Board, in co-operation with the Canadian Horticultural Council. The provincial boards are also responsible for the approval of all expenditure incurred in their respective provinces.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1934*

PRODUCE OF CROPS

THE areas returned in June, 1934, as under wheat, barley, sugar-beet and mangolds were larger, while the areas under most other crops were smaller than those returned under the same crops in 1933. The acreage under both meadow hay and seeds hay in 1934 was greater than in the previous year.

With the exception of oats, mixed corn, hay and turnips and swedes, yields were higher than in 1933, but, owing to smaller acreages, estimated total production in England and Wales is lower except for wheat, barley, hay, peas and mangolds. The estimated production of wheat during 1934 is greater by 11 per cent. than that of last year, while for peas, barley and mangolds, the increases are 8 per cent., 15 per cent. and 14 per cent. respectively.

The estimated yields of the corn crops are higher than the average yields of the past ten years. Of the other crops referred to above, only potatoes and mangolds show yields higher than the ten years' averages.

Corn Crops : *Wheat*.—The area under wheat in England and Wales in 1934 was 1,759,410 acres, and was 6 per cent. more than in 1933, while the estimated yield per acre over the whole country was 19.9 cwt. compared with 19.0 cwt. in the previous year. The net result is that the total production of wheat for this year is estimated to be 1,748,000 tons, or 175,000 tons more than last year, an increase of 11 per cent. Throughout the country yields were generally higher than the local ten years' averages, the average yield of wheat for the whole country being 2.4 cwt. per acre above the ten years' average, while in the South-Eastern, South-Western, and West-Midland Divisions, the yields per acre were higher by as much as 3.1 cwt. in the first named, and 2.9 cwt. in the other two divisions. The average yield per acre in Lincoln (parts of Holland) was 5.8 cwt. more than the average yield for the previous ten years.

* This return was published on December 21, 1934.

AGRICULTURAL RETURNS, 1934

PRELIMINARY STATEMENT SHOWING THE ESTIMATED TOTAL PRODUCE AND YIELD PER ACRE OF THE CORN, HAY AND ROOT CROPS IN ENGLAND AND WALES IN 1934, WITH COMPARISONS FOR 1933, AND THE AVERAGE YIELD PER ACRE OF THE TEN YEARS 1924-1933.

Crops	Estimated Total Produce		Acreage		Estimated Yield per Acre		
	1934	1933	1934	1933	1934	1933	Average of the ten years, 1924-1933
	Thousands of Tons	Thousands of Tons	Acres	Acres	Cwt.	Cwt.	Cwt.
Wheat ..	1,748	1,573	1,759,410	1,660,360	19.9	19.0	17.5
Barley ..	727	631	860,594	751,345	16.9	16.8	16.0
Oats ..	1,116	1,226	1,401,681	1,494,498	15.9	16.4	15.6
Mixed Corn	77	85	95,733	103,975	16.0	16.3	15.5
Beans ..	116	118	134,913	139,135	17.2	16.9	16.7
Peas ..	56	52	68,616	72,665	18.3	14.4	14.6
Seeds Hay*	1,553	1,552	1,288,786	1,261,009	24.1	24.6	28.1
Meadow Hay† ..	4,152	4,135	4,822,651	4,603,764	17.2	18.0	20.3
Potatoes ..	3,439	3,478	487,558	518,934	7.1	6.7	6.3
Turnips and Swedes ..	4,658	5,951	518,785	553,435	9.0	10.8	12.4
Mangolds ..	4,733	4,136	245,943	237,318	19.2	17.4	18.9

* Hay from Clover, Sainfoin and Grasses under rotation.

† Hay from Permanent Grass.

Barley.—There was an increase of 109,249 acres under barley as compared with 1933, an increase of nearly 14.5 per cent. There was also an estimated increase of 0.1 cwt. in the average yield per acre, and the estimated total production of 727,000 tons is, consequently, 96,000 tons above the figure for 1933, an increase of approximately 15 per cent. The estimated average yield of 16.9 cwt. per acre for the whole country is 0.9 cwt. per acre above the ten years' average. In England, the majority of the counties show yields larger than the previous ten years' averages, the largest divisional increase over the ten years' average being that of 1.2 cwt. per acre in the Eastern division.

Oats.—The estimated average yield of oats per acre shows a small decrease from the 1933 yield, and as there was also a decrease of 92,817 acres, or approximately 6 per cent. in the area under the crop, the total estimated production of oats for this year is appreciably smaller than it was for 1933, the reduction being equivalent to 9 per cent. The yield per acre this year, however, was slightly more than

Agricultural Returns, 1934

the yield for the average of the preceding ten years, most counties showing an improvement. The greatest improvement was shown in the North-Eastern Division, where the yield was more than 1.1 cwt. per acre above the divisional average for the years 1924-1933. The estimated yield per acre for the whole country is 0.3 cwt. above the ten-year average.

Mixed Corn.—There were 8,242 acres less under mixed corn in 1934 than in the previous year, a decline of over 8 per cent., and in addition the estimated average yield of 16.0 cwt. per acre was 0.3 cwt. below that of 1933. The total production, therefore, for the whole country compares unfavourably with the production for 1933, and the estimate of 77,000 tons is 9 per cent. less than that of 85,000 tons in the previous year. There is, however, an increase of 0.5 cwt. in the yield per acre as compared with the average of the previous ten years, and in Lincoln (parts of Holland) the increase is as much as 3 cwt.

Beans.—The average yield of beans is 0.3 cwt. per acre above the yield of last year, and the ten years' average has been exceeded by 0.5 cwt. The area harvested as corn was 134,913 acres, and was smaller by 3 per cent. than the corresponding area in the previous year; the total production of beans harvested as corn, which is estimated at 116,000 tons, is therefore nearly 2 per cent., or 2,000 tons smaller than in 1933. The greatest divisional increase in average yield per acre was 1.5 cwt. in the North-Eastern Division.

Peas.—The estimated yield per acre of peas harvested as corn shows an appreciable increase over both the yield last year and the average for the preceding ten years of 1.9 cwt. and 1.7 cwt. per acre respectively. The area harvested as corn was smaller by 6 per cent. than last year, but owing to the increased yield, the total estimated production of 56,000 tons is 4,000 tons or 8 per cent. greater than in 1933. Again, the increased yields have been most pronounced in the North-Eastern Division, where an increase of nearly 2.2 cwt. above the average yield for the previous ten years is recorded.

Hay.—Although showery weather was experienced during the hay-making season, the hay crop was secured in good condition, and only a very small proportion was

AGRICULTURAL RETURNS, 1934

damaged by rain. The crop was, however, on the light side, though the quality was good.

Seeds Hay.—The yield of seeds hay is 4.0 cwt. per acre below the ten years' average, and 0.5 cwt. per acre below the yield for 1933. As, however, the crop was taken from an area greater by 27,777 acres, or 2 per cent. the total production, estimated at 1,553,000 tons, is slightly larger than that of 1933. The smaller yield was general, and most marked in the Eastern and East-Midland Divisions, where the average yields were 7.1 cwt. and 6.8 cwt. per acre respectively, below the divisional averages for the previous ten years.

Meadow Hay.—The yield of meadow hay was 0.8 cwt. per acre below that of 1933, and 3.1 cwt. per acre below the average production for the previous ten years, but since the area was 218,887 acres or nearly 5 per cent. larger than in 1933, there is a slight increase in the estimated total production, compared with last year. The total production for this year is 4,152,000 tons, while that for 1933 was 4,135,000 tons. Smaller yields than average were general over the whole country, and in the Eastern Division the yield was as much as 5.7 cwt. per acre below the ten years' average.

Potatoes.—The area under potatoes which had increased during each of the previous three years, showed a decline in 1934. The area under the crop was smaller this year by 31,376 acres, or 6 per cent., than in 1933, but the yield was 0.4 ton per acre higher than in the previous year, and 0.8 ton per acre above the average for the previous ten years.

In spite of the reduction in area under the crop, the total production of 3,439,000 tons is only 39,000 tons or 1 per cent. less than last year's crop, but is 358,000 tons more than the average production of the past ten years. With the exception of the North-Western Division, the average yields in each division were higher than those for the previous ten years, while in the North-Eastern Division the yield was 1.4 tons in excess of the divisional ten year average.

The Ministry's estimate of total production includes seeds and chats in addition to ware potatoes, and also covers first and second earlies as well as the main crop.

Roots : Turnips and Swedes.—The area on which the crop of turnips and swedes was grown showed a decrease

AGRICULTURAL RETURNS, 1934

of 6 per cent. or ~~34,550~~ 34,550 acres as compared with 1933, and the total production for this year is estimated to be 1,293,000 tons less than last year, a decrease of 22 per cent. The total production for this year is estimated to be 1.8 tons per acre below the yield for 1933, and 3.4 tons per acre below the average yield for the previous ten years. In only two counties, namely, Norfolk and the Isle of Wight, were the yields greater than the average county yields of the past ten years.

Mangolds.—The area under mangolds this year was 245,943 acres, being greater than the corresponding area in 1933 by nearly 4 per cent. The estimated yield of the crop is also greater by 1.8 tons per acre, and the estimated total production of 4,733,000 tons exceeds by 597,000 tons or 14 per cent. the total production in 1933. Yields varied considerably, in some counties being 3 tons per acre below the average yield for the past ten years, while other counties were as much above. In one county, namely, Cumberland, the average yield per acre was 5.7 tons above the average yield per acre for that county during the previous ten years.

Sugar-Beet.—The area under sugar-beet was 396,348 acres, or 32,280 acres larger than last year. The yield of washed and topped beets is estimated at 8.9 tons per acre or 0.1 ton per acre less than that of 1933. It is anticipated that the total production of washed and topped beet will slightly exceed $3\frac{1}{2}$ million tons.

FEBRUARY ON THE FARM

H. G. ROBINSON, M.Sc.,

Midland Agricultural College, Sutton Bonington.

The Mild Winter.—Few winters within memory can compare with this for mitigating the effects of a preceding dry summer. As far as the South and Midlands are concerned, grass growth has been continuous almost up to mid-January, with little interference from severe frosts. The rich colour is typical of spring just when growth is in the fresh, early stages. This continued growth in winter has also been shown by the relatively good weights per acre realized with late-lifted beet crops; while roots that have been clamped on the roadsides awaiting transportation to the factories have put out considerable growth of shoots. Rainfall has, to some extent, made good the earlier deficiencies, although in the Eastern Midlands the penetration is relatively shallow, and more rain is needed to restore the underground balance.

The mild winter, combined with the freedom from weather interference with normal farmwork, has been responsible for much progress with winter duties on the arable land. In certain instances, the heavy rains have made conditions unsuitable for muck carting and ploughing. It is also interesting to observe that pneumatic tyres on tractors and farm carts have had their first real trial since their introduction. Some adverse opinions have been expressed, especially where soils “churn” on the surface. In one instance, beet carting had to be discontinued with this type of cart, the wheels sinking down to the axles. Their advantages, however, greatly outweigh a temporary difficulty of this kind.

Outwintered stock have been particularly favoured, both by the availability of grazing and the mildness of the weather. One wonders whether this kind of thing is too good to last; but, up to the present, a great deal less hay has been used than with normal conditions prevailing. Incidentally, there are numerous herds of dairy cows that, up to the middle of January, had not been housed except for the milking periods. The influence of these weather conditions has, in general, been entirely favourable from

FEBRUARY ON THE FARM

most farming aspects. Feeding costs have been definitely reduced. On the Midland College Farm, dairy cows have held to their milk better than in a normal winter, and mortality amongst young pigs has not been so heavy.

With regard to February expectations one hesitates to prophesy. The routine work on the arable land includes muck carting, ploughing for spring corn, especially after ground has been cleared of crops eaten off by sheep, and cross-ploughing for roots. As weather conditions allow, a start is made with seedings of oats, barley, beans, vetches and peas. On the grass land, there is ample scope for chain or spike harrowing, the application of manures, and rolling. It is sometimes advisable at this season to decide upon the meadows that are to be laid up for hay, and to free them from stock from now onwards. This is especially true of the Midlands and south of England, where hay harvest is likely to take place in the middle of June. Later freeing dates are usual in the north, but there the occurrence of a higher summer rainfall, and freer growing conditions during June, make this course possible.

The Spring Oat Crop.—With the advent of February, thoughts turn naturally to the apportionment of ground for spring seedings, even though the sowing dates are frequently ahead of actual spring. There has been a fairly general tendency to reduce the area under oats, a factor that has been influenced by the relatively greater profits to be derived from wheat under the influence of the wheat deficiency payments. As far as the typically arable districts are concerned, this is not surprising. Some varieties of wheat give good yields even from sowings as late as February, while oats, as a crop, have not been so fool-proof. There are factors, however, apart from the sale of grain, that give the oat crop a claim to consideration on all farms where stock is kept. In the present winter, the availability of oat straw is proving a valuable supplement to the restricted stocks of hay. The increase in the price of hay and the fact that, at the end of the present winter, there will not be any large carry-over to next winter, makes it all the more necessary on stock farms to give consideration to future fodder requirements.

Climatic conditions materially affect the cropping results. In general, oats are specially identified with the north and

FEBRUARY ON THE FARM

west of England. A study of the correlation of oat yields with meteorological observations, by R. Alun Roberts, in North Wales, indicated the desirability of cool, humid conditions. Conditions depressing the yield of grain arose from high temperatures with absence of rain in the later stages of ripening. The writer's own observations in the Eastern Midlands show that a spell of warm weather, to secure rapid germination, brairding and early establishment of the plant is particularly valuable. A good early start, establishing an adequate root development, can often carry the plant through adverse weather in later months, although, during the past two years of low summer rainfall, soils with good moisture-holding properties have been equally necessary. Since it is impossible to control climatic conditions, an effort must be made by due attention to cultivation, manuring and the state of the land, to secure the combination of a proper seed-bed with a suitable sowing date, in order to make the best of existing circumstances. This control can probably be exercised best where the acreage involved is not large, as in the case of the smaller mixed farms.

The date of sowing oats is also calculated to influence the yield of grain and straw. Early-sowings, provided soil conditions are suitable, are now generally favoured. In the south and midlands, oat seedings can be made from February onwards. In the north, the seedings are later, but some interesting experiments at the North of Scotland Agricultural College Experimental Farm, Craibstone, have shown that weekly sowings of oats from March 29 to May 3 reveal a steady decline in the yield of grain and straw as the sowing dates are delayed. Two reasons favour early seedings. The first relates to the earlier establishment of the plant and the subsequent capacity for resisting drought; the second concerns the reduction of damage occasioned by Frit Fly attack on early-sown crops. Other important benefits are that weed competition is never so severe with the early-sown crop, because the oat plant is better established and better able to check competitive weed growth.

The choice of a suitable variety is not a difficult matter in these days, especially as trials are conducted by the National Institute of Agricultural Botany in various parts of the country. In the Eastern Midlands, Marvellous is the variety best favoured for early February seedings, being specially suitable for rich soils by reason of its large yields

FEBRUARY ON THE FARM

of grain and the stoutness of its straw, which resists lodging satisfactorily. A competitive oat called Resistance has been placed on the market by the N.I.A.B. in the present season. Although a winter variety, it can be sown until the end of February. It is specially recommended for soils in high fertility, by reason of its very short straw. The grain too is small, so that this oat will be more valuable for feeding on the farm than for sale. The most popular of the ordinary spring oats are Victory and Abundance, which are specially favoured for sale purposes. Some of the newer oats from the Svalöf Plant Breeding Station in Sweden have proved very successful; and, of these, Eagle, Star and Golden Rain deserve mention. The last-named is a yellow oat, for which reason it is not greatly favoured for selling, since buyers are sometimes afraid that it is more difficult to detect a mow-burnt sample of grain in coloured corn.

The seed rates for oats differ with the variety and the district. In general the larger-grained varieties should be more thickly sown than those with small grains or with good tillering capacities. It has been shown also, in recent years, that the vitality of germinating seed is greatly affected by the presence of various fungus diseases that tend to affect the number of plants that appear above ground. The use of organic compounds of mercury as powder seed dressings has been shown to improve brairding results and the subsequent yielding capacity. In the north, the influence of this has been to make possible a reduction in the seed rate; the normal rates being four to five bushels per acre. With oats, as with many other crops, the prospect of satisfactory yields is increased with adequate seed rates.

In the interests of subsequent crop production, it is desirable to pay some attention to the sample of seed sown. While there is abundant evidence to justify the claims made on behalf of a good variety, there is almost equal evidence to show that well-dressed seed corn, of uniform size and plumpness, with a high germination efficiency, will give more satisfactory results than samples that are sown just as obtained from the average threshing machine. This fact is deserving of wider recognition, even if it emphasizes the necessity for dressing home-grown samples of seed corn. The question of change of seed in oats arises particularly where it is impossible to ripen a good sample of grain.

FEBRUARY ON THE FARM

Live Stock.—February is quite a critical month for live stock in an ordinary winter. In fact, the efficiency of management may be reflected in the appearance of out-wintered stock at this date and on the freedom of housed stock from a variety of troubles that have had time to develop. The most serious difficulties arise with housed animals. With dairy cows, neglect may lead to their having itchy skins, which, where insects are responsible, can be controlled by frequent grooming and the application of appropriate dressings. The absence of injuries on the knees or hocks of dairy cows also reflects the suitability of the conditions under which they are kept. The variety of factors involved in this have been already discussed (August, 1934), but it is worthy of note that, in the present winter, all the heifers kept on the " Monopavet " standings in the cowshed on the Midland College Farm have escaped injury so far. This cannot be said of the concrete standings in the same cowshed, irrespective of the method of cow tie,

The appearance of cramp and rickets in young and feeding pigs indicates improper feeding and management. Attention must be paid to the flooring, but equally essential is the safeguarding of the vitamin content of the food, while avoidance of an excessive water allowance results in drier quarters.

NOTES ON MANURING.

F. RAYNS, M.A., and G. H. BATES, D.Sc.,
Norfolk Agricultural Station.

Potato Manuring.—Dung is generally regarded as the basis of all potato manuring; from 10 to 20 tons per acre is the usual recommendation. In parts of Lincolnshire it is of necessity replaced by artificials, and in other localities by clover ploughed in as a green manure. It is claimed that this last-named practice gives even better results than a dressing of farmyard manure. It is at least to be preferred to an all-mineral dressing, for diseases such as Spraing and Common Scab are associated with a deficiency of organic matter in the soil.

Many growers, however, associate potato disease with dung, and use artificials only. It may, of course, be possible by feeding stock with diseased tubers to return the infection to the land, and from the standpoint of soil hygiene, there is much to commend in the practice of boiling potatoes before feeding. If this simple precaution is taken the dung from potato-fed animals may be safely used for subsequent potato crops.

Practices vary in the application of dung. In some localities it is spread and ploughed in during winter; in others it is spread down the ridges and the tubers are planted directly on top of it. This latter method usually results in a quicker growth in the first stages and is an advantage for early varieties, but for maincrops and late potatoes the two practices are of equal value.

Artificial Manures.—What is the maximum quantity of artificials that will repay application? Trials at the Midland Agricultural College showed that with 12 tons of dung per acre, 12 cwt. of artificials was the maximum quantity that could be so used. On the deep and responsive silt soils of Lincolnshire (where the rainfall is low) up to 20 cwt. per acre may be used, though trials on similar soils in Norfolk gave no commensurable response beyond 15 cwt. It is obvious that no definite rules can be laid down; for much depends on the manuring of previous crops, the mixture which it is proposed to use, the variety of potato and so

NOTES ON MANURING

on; but the potato must be liberally treated, and as a rule 10-12 cwt. of a complete mixture is the minimum quantity of artificials to use. Generally it pays to dress even more heavily. Rather less seems to be required in the North.

Much experimental work has been done upon the use of the different fertilizing ingredients of the mixture, i.e., the nitrogen, phosphates and potash. It has been demonstrated (in America and elsewhere) that nitrogenous manures influence the yield and size of ware—an important observation in view of the restrictions imposed by the Potato Marketing Board. Sulphate of ammonia appears to be the best source of nitrogen. There has been much difference of opinion in recent years, on the question of the proportion of phosphates in the mixture, the modern tendency of scientific opinion being to reduce the amount considerably. On the other hand, for some years past, manufacturers have been producing compound potato manures with a high proportion of phosphates. Where these manures have been used, as they have in most potato-growing districts, soil reserves of phosphate must have increased considerably, and it may be that the omission of phosphate in trials in those localities has produced unexpected results on account of the accumulated reserves from previous manuring. This reserve is not inexhaustible, and the present tendency to use less phosphatic manure for potatoes may prove harmful in time.

Potatoes generally respond to potash, but the response varies appreciably according to the weather. Potash manures undoubtedly encourage early growth, though strangely enough the proportion of potash is usually reduced in manures for early potatoes. This practice appears to be based on the assumption that potash is only slowly available and will not benefit a short-lived crop—a theory which is not supported by experience. On the other hand, the various potash manures affect both the time of ripening and the quality of the tubers; the sulphate produces the best quality, and potash in the form of chlorides promotes earlier ripening.

Potato Mixtures.—Trials carried out over four seasons on silt soils in the Norfolk Marshlands showed that the best results were obtained with a dressing of 5 parts sulphate of ammonia, 6 parts superphosphate (35 per cent.), and 4 parts sulphate of potash. Expressed in percentages, this

NOTES ON MANURING

mixture would contain 6.6 per cent. nitrogen, 7 per cent. soluble phosphoric acid (15 per cent. phosphate of lime), and 12.8 per cent. potash.

Fen soils present a peculiar problem; some will respond to dressings of 2 cwt. per acre of sulphate of ammonia, on soils where cereal crops always lodge. It is possible that potatoes require a more readily available form of nitrogen than that naturally present in fen soils. Dressings of 8 cwt. of superphosphate (35 per cent.) per acre are usually employed, and in addition 2 cwt. per acre of sulphate of potash give a profitable response over a number of years. This dressing expressed in percentages would contain 3.3 per cent. nitrogen, 11.6 per cent. soluble phosphoric acid (23.3 per cent. phosphate of lime), and 8 per cent. potash.

A mixture that is reliable for general use may be made from 2 parts sulphate of ammonia, 3 parts superphosphate (35 per cent.), and 2 parts sulphate of potash. The analysis of this mixture would be approximately 5.7 per cent. nitrogen, 7.5 per cent. soluble phosphoric acid (16 per cent. phosphate of lime), and 13.7 per cent. potash.

Trials carried out in Norfolk over three seasons suggest that it is an advantage to apply the fertilizer along the bottom of the ridges and then to work it in. This practice results in earlier growth and increased yields compared with the usual method, which is to broadcast before splitting the ridges back over the sets. Where the manure is sown in the bottom of the ridge it should be lightly covered with soil to avoid injury to the developing roots of the plant. It is convenient in practice to attach small pieces of chain to the manure drill and in this way to pull them along the ridge after the fertilizer has been distributed.

Lodging in Cereals.—There is little information in the scientific literature regarding the precise effects of manures in causing or preventing cereals from lodging. Farmers generally assume that there is some connexion between manuring and lodging, and frequently ask for advice as to a manurial treatment that will “strengthen the straw.” That suitable manuring may strengthen the straw is supported by experiments carried out in Germany. In one investigation, potash starvation checked the growth of barley, and strengthened the thickness of the epidermal cells. In a second, an optimum supply of nitrogen resulted in greater strength of straw; heavy phosphatic applications

NOTES ON MANURING

produced thicker and more extended cell walls and earlier development of the mechanical tissues. Potash also increased the strength of straw, but excessive nitrogen made the crop more likely to lodge. Other results suggest that a deficiency of nitrogen and phosphates may actually increase the strength of the lower internodes of the plant, and potash starvation, while increasing the strength of the lower internodes, decreases that of the middle internodes.

To some extent these findings are contradictory, but that is unimportant from a practical point of view, for several authorities point out that strength of straw is only one of a number of factors that determine resistance to lodging. There must also be considered, the rooting system, the elasticity of the straw, the length in regard to the strength, and the amount of the foliage, while it may perhaps also be suggested that the weight of the ear relative to each of the above factors must also be considered.

On the chemical side it has been shown that the silica, ash and lignin content of lodged straw is reduced as compared with that not lodged, and that nitrate of soda, by depressing the ash and silica content may weaken the straw and cause lodging.

In the Guide to Experiments, 1934, of the Jealott's Hill Agricultural Research Station, it is stated that the addition of extra phosphates and potash failed to improve the standing capacity of wheat heavily manured with nitrogenous manures. A similar result was obtained at Sprowston in 1932, when barley was grown on land purposely heavily folded with sheep. Extra manuring increased lodging without increasing the amount of harvested grain.

Thus on rich soils manuring is not likely materially to assist crops to stand up to harvest.

On a poor soil, however, at the Craibstone Experimental Station, a complete mixture of artificials produced a better-standing crop than an incomplete (and smaller) dressing; while potash and phosphates alone had no beneficial effect.

Similarly, in a three-years' experiment at Sprowston on poor soil (the average crop of barley without manure being about 4 quarters per acre) a complete mixture of phosphatic, potassic and nitrogenous manures improved the standing capacity of the barley. On better land the same treatment caused lodging.

The problem of lodging is really one for the plant breeder, but manuring obviously exerts some influence.

NOTES ON MANURING

Fortunately, there are signs that oats and wheats of improved standing capacity may soon be available. Then it will be safe to manure more heavily. It is, however, difficult to interpret in practical terms the results of the investigations into the effects of manures on the structure of cereals.

It is helpful to remember, in practice, that there is a maximum yield (which is likely to vary from year to year) at which all the present varieties of cereals will lodge. It does not matter by how much the application of manures strengthens the straw, or influences for the better any of the other attributes that prevent lodging, cereals will always lodge in bad weather if the yield is heavy enough.

Thus, provided the use of balanced manures does not cause the yield to exceed that limit (which is obviously a varietal characteristic) the crop will stand; otherwise it will go down. The danger point is reached more quickly on good than on poor soils, where balanced manuring would be expected to influence standing capacity over a greater range of yield increases. In the end, however, the physiological limit to the standing capacity of the variety would be reached, and it would lodge as badly as on better land.

Actually, the use of manures in preventing lodging is limited, and it is unwise in practice to rely too much upon them.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended January 9				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	7 12d	7 12d	7 12d	7 12d	9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20·6%) ..	7 2d	7 2d	7 2d	7 2d	6 11
Calcium cyanamide (N. 20·6%)	7 1s	7 1s	7 1s	7 1s	6 10
Kainit (Pot. 14%) ..	3 0	2 14	2 12	2 14g	3 10
Potash salts (Pot. 30%) ..	4 11	4 6	4 4	4 6g	2 10
" " (Pot. 20%) ..	3 12	3 6	3 3	3 6g	3 4
Muriate of potash (Pot. 50%)	7 4	6 16	6 12	6 16g	2 9
Sulphate, " " (Pot. 48%)	8 3	7 18	7 12	7 18g	3 3
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26·27½%) ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19	2 16k	3 6
" " (S.P.A. 13½%) ..	2 15	2 11	2 15	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	..	6 17	6 15f	6 7	..
Steamed bone-flour (N. 4½%, P.A. 27½-29½%) ..	5 12	5 12	5 10f	5 10	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. B. MERCER, M.C., B.Sc. (Principal), and Colleagues,
Cheshire School of Agriculture, Reaseheath, Nantwich.

DURING the next two months many thousands of calves will doubtless be sold in the dairying areas at prices ranging around £1 per head. Simultaneously numbers of calves will change hands in Northern markets at £4 to £5 apiece. Transport costs, risks of scour and so forth complicate the matter; but the main fact appears to be that the calves in question are differently bred, and the price disparity reflects the practical man's evaluation of their relative "feedability."

A similar disparity exists between the prices per cwt. of feeding stores "of the right sort" and animals popularly described as "common," "rough" or "poor doers." There is reason to doubt whether real values are correctly expressed in sale prices. It seems probable that, as in the case of the coloury young cow ("ain't she a beauty?") competition for the beast that carries the mark of "quality" drives up the price above the level indicated by strict economics. That there is a considerable difference in real values, however, no practical feeder will dispute. It is much harder to explain the reasons than to demonstrate the fact.

Individual Variation.—The fact that one animal "feeds" better than another may be due to differences in digestion efficiency (or to be more correct "conversion" efficiency), to differences in appetite, or to a combination of the two factors.

According to Kellner, different breeds of the same species of animal possess an equal digestive power, and the individual variation within breeds is small, provided the animals are in good health—he puts the average percentage error in experiments at 3 to 4 per cent. of the ingested organic matter. Armsby states that individual variations may in some instances be larger; in a three-year experiment with beef-bred and "scrub" steers he found the latter had a maintenance requirement 10 per cent. higher than the former. He advances evidence to show that this difference is not attributable to differences in powers of digestion, but rather to variation in the daily expenditure of energy—the

NOTES ON FEEDING

nervous restless beast continually using up more than the animal of quiet "phlegmatic" disposition.

In a recent American study with Shorthorn steers of beef type, individual animals produced dead-weight increases ranging from 14.3 to 22.1 lb. from equal quantities of digestible nutrients—a range of almost 25 per cent. above and below the mean.

Inevitably the reader's mind switches to the case of human beings, where temperamental differences are presumably far more marked. "Sleek-headed men and such as sleep o' nights" are not always heavy feeders. As girt Jan Ridd observes, "Some creatures require a deal of food and some can do with very little. The plumpest and most perfect women never eat so hard and fast as the skinny and three-cornered ones."

Appetite, however, appears to play a considerable part in certain functional activities of animals. Probably the bullocks, sheep and pigs that fatten most quickly are generally those that best look after themselves at the trough. Whether they are the most economical feeders is another matter. The best layer in the flock is generally the most voracious feeder.

Experimental Methods.—An extremely interesting position has developed as a result of the publication of G. Dunlop's recent review of methods of experimentation in animal nutrition. Most feeding experiments in the country—and indeed in other countries—have been carried out with groups of live stock, fed much as they are fed under farm conditions. As is well known, the error attaching to the result (generally measured in terms of live weight gain per beast) is very considerable. Efforts to lessen this error by careful selection and "pairing" of individuals, after preliminary trial, and by the application of appropriate statistical methods, have proved but partially successful. Speaking generally, the error attaching to a group trial is expected to be of the order of 10 per cent., and it is largely owing to this fact that so little progress has been made in the quantitative measurement of such things as the mineral requirements of farm stock.

It has for a long time been obvious that the group feeding experiment involved a serious assumption. It is one thing to feed 20 lb. of meal to a group of five pigs in a pen; it is quite another to say that the five have had 4 lb. apiece

NOTES ON FEEDING

(even in nursery days we learned that "this little pig got roast beef, this little pig had none," while the unfortunate rit, having had no breakfast before setting out, cried all the way home).

Individual feeding of experimental animals, though admitting of accurate measurement of food intake, has been found to result in growth-rate variations almost as great as group feeding. Dunlop concludes that as the utilization of food by an animal is affected by the plane of nutrition, it is necessary, in order to secure greater uniformity in trials, to feed all animals individually at a predetermined rate based on their live weights, and to measure the effect of the food under trial primarily by the increase in live weight from a given starting point in a given time.

Using pigs from the Cambridge University herd he adopted a scale of feeding commencing at 3.35 lb. of meal per day (70 per cent. starch equivalent) when the animals were of 70 lb. live weight, and increasing gradually to 5.9 lb. when they reached 160 lb. live weight. With this system of experimentation he obtained results several times more accurate than group feeding trials commonly give. So sensitive is it, indeed, that with groups of only five animals, 5 per cent. differences in the group averages become significant.

Unfortunately the method is not likely to make much of an appeal to the practical farmer, who will be apt to argue that, since animals must perforce be fed in groups on the farm the results of individual feeding tests cannot be reproduced in practice, but it is quite possible that it may lead to a ready solution of such urgent problems as the effect of rapid and slow feeding on gradability of pig carcasses. Every pig feeder is asking for information as to how good grading results can be obtained: and echo answers How?

The evidence cited is not without significance, too, in the theory of feeding dairy cows. Our standard method of rationing assumes that a cow makes equally good use of her food when she is given 15 lb. of a production ration as when she is given 3 lb. If she **does** possess such an elastic efficiency she is indeed fearfully and wonderfully made.

Feeding Cattle.—The problem of profit-making in cattle feeding grows steadily more difficult. With costs of feeding approaching 9d. a lb. live weight increase and prices ranging around 4d. a famous political slogan is daily

NOTES ON FEEDING

reversed. Cheap feeding is plainly imperative if profits are to be secured. From the standpoint of food units consumed it is easy to show that rapid feeding from birth to slaughter is more economical than easy-going methods involving a long store- or slowly-growing period. The late T. B. Wood, it may be remembered, calculated that 10 cwt. of baby beef could be produced from 8,300 lb. of dry matter consumed, whereas a 12-cwt. bullock $2\frac{1}{2}$ years old consumed 14,600 lb. of dry matter in the course of its life. The argument, however, is merely academic until costs are substituted for pounds of dry matter, since the dry matter in question may vary in value from 2s. 6d. per cwt. for pasture grass up to 10s. per cwt. for linseed cake.

Most northern feeders still hold the view that cattle should be given time to grow as well as fatten, and that the chief hope of profits lies in a comparatively long and cheap store period. On arable farms a policy of cheap wintering is generally favoured in preference to old-time winter feeding—though naturally everything depends, in the individual case, upon the forwardness or otherwise of the animal in autumn. A good deal of interest has been aroused in feeding areas by the Aberdeen out-wintering experiments recently reported upon by D. G. Munro. In these trials Irish stores out-wintered on straw and turnips made definitely higher gains than animals similarly-fed in covered yards or courts. Moreover, they made greater response to the spring grass when that became available—cattle wintered in yards frequently showing at the outset of the grazing season a definite decrease in live weight attributable to scouring. Apparently out-wintering has a measurable effect on the general metabolism of the animal, not only enabling it to make better use of the food consumed at the time, but also assisting it to utilize spring grass later on. The rate of live weight increase throughout the winter in all these trials, it may be noted, was limited to 1.2 to 1.4 lb. per day. It is impossible to judge the true economics of such "storing" in the absence of cost accounts for the home-produced crops.

In any event, some genuine winter fattening is inevitable in feeding areas, since the state of forwardness of cattle in the autumn cannot be entirely controlled. Roots, straw and home-grown corn still constitute the staple diet for winter feeding, and owing to the large quantities employed, digestive troubles are by no means rare. On certain farms

NOTES ON FEEDING

with which the writers are familiar, whole linseed, used in the proportion of 1 part linseed to 6 or 7 parts of cereals, has proved a useful counter to such difficulties. Nominally expensive, linseed is not in reality a very dear food, as its starch equivalent is nearly double that of linseed cake. It has, moreover, the effect of improving the touch and "finish" of fat animals, and certainly farmers who employ this food find a ready sale for their cattle. A further advantage in the use of linseed is the fact that it enables feeders to use a larger quantity of wheat than would otherwise be safe practice.

In view of the large amounts of second-grade beef on offer, quality in the carcass is now of even greater importance than of yore. For high-class trade maize should be avoided in the last stages of fattening, despite its cheapness. We could quote instances of farmers who have lost really good markets for their cattle by the substitution of maize for oats in the ration.

Fat in Milk.—Every agricultural adviser is from time to time called into consultation in connexion with low fat percentages in milk. The facts being established—if they are established!—possible causes and remedies are numerous. In certain cases where the farm was maintaining a high output on an apparently sound ration we have been driven, as a last resort, to *reducing* the feed. This naturally has the effect of reducing the quantity; but the gross yield falls quicker than the fat output, hence the quality rises. Agricultural advisers would not be popular if this device were generally recommended—but sometimes any sacrifice is justifiable.

Heated Hay.—Years ago when silage was achieving its post-War revival, milk sometimes became tainted through feeding this odoriferous substance at milking time. 'As a rule a taint so acquired does not make itself manifest until milk has stood for a few hours in the churn. One of the writers was recently called in to trace a similar taint, which he ultimately brought home to hay that had become overheated in the stack. It was, of course, easily avoided by the simple precaution of feeding the hay after instead of before the milking hour, and keeping the feeding "bing" clean.

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British	£ 5 0	£ 0 8	£ 4 12	72	s. d. 1 3	d. 0.67	% 9.6
Barley, British feeding	6 5	0 7	5 18	71	1 8	0.89	6.2
" Canadian, No. 3 Western ..	7 12	0 7	7 5	71	2 1	1.12	6.2
" Persian	6 13*	0 7	6 6	71	1 9	0.94	6.2
" Polish	7 5	0 7	6 18	71	1 11	1.03	6.2
Oats, English, white	7 7	0 8	6 19	60	2 4	1.25	7.6
" black and grey	7 7	0 8	6 19	60	2 4	1.25	7.6
" Scotch, white	7 17	0 8	7 9	60	2 6	1.34	7.6
" Canadian, No. 2 Western ..	8 3	0 8	7 15	60	2 7	1.38	7.6
" mixed feed	6 13	0 8	6 5	60	2 1	1.12	7.6
" Chilian	7 13‡	0 8	7 5	60	2 5	1.29	7.6
Maize, Argentine	5 7	0 6	5 1	78	1 4	0.71	7.6
" Danubian, Gal. Fox	5 5†	0 6	4 19	78	1 3	0.67	7.6
" South African, No. 2 White Flat	5 15†	0 6	5 9	78	1 5	0.76	7.6
" South African, No. 4 Yellow	5 12†	0 6	5 6	78	1 4	0.71	7.6
Beans, English, winter	5 15‡	0 15	5 0	66	1 6	0.80	19.7
Peas, English, blue	9 0‡	0 13	8 7	69	2 5	1.29	18.1
" Japanese	15 2†	0 13	14 9	69	4 2	2.23	18.1
Darl	7 2†	0 7	6 15	74	1 10	0.98	7.2
Milling offals—Bran, British " broad	6 5	0 14	5 11	43	2 7	1.38	9.9
Middlings, fine, imported ..	6 10	0 14	5 16	43	2 8	1.43	10
Weatings†	6 5	0 13	5 12	56	2 0	1.07	10.7
" Superfine†	6 17	0 12	6 5	60	1 10	0.98	12.1
Pollards, imported	6 2	0 13	5 9	50	2 2	1.16	11
Meal, barley	8 2	0 7	7 15	71	2 2	1.16	6.2
" grade II	7 7	0 7	7 0	71	2 0	1.07	6.2
" maize	6 2	0 6	5 16	78	1 6	0.80	7.6
" South African	5 15	0 6	5 9	78	1 5	0.76	7.6
" germ	6 5	0 10	5 15	79	1 5	0.76	8.5
" locust bean	7 10	0 5	7 5	71	2 1	1.12	3.6
" bean	8 5	0 15	7 10	66	2 3	1.21	19.7
" fish, white	15 15	1 19	13 16	59	4 8	2.50	53
Maize, cooked, flaked	6 15	0 6	6 9	84	1 6	0.80	9.2
" gluten feed	6 0	0 12	5 8	76	1 5	0.76	19.2
Linseed cake, English, 12% oil ..	9 2	0 19	8 3	74	2 2	1.16	24.6
" " " 9% "	8 15	0 19	7 16	74	2 1	1.12	24.6
" " " 8% "	8 10	0 19	7 11	74	2 0	1.07	24.6
" " " 6% "	8 17‡	0 19	7 18	74	2 2	1.16	24.6
Soya-bean cake, 54% oil	7 12‡	1 6	6 6	69	1 10	0.98	36.9
Cottonseed cake—English, Egypt- " " " 41% oil	5 0	0 16	4 4	42	2 0	1.07	17.3
" " " 41% "	4 15	0 16	3 19	42	1 11	1.03	17.3
" " " decorticated, 7% " ..	7 12†	1 6	6 6	68	1 10	0.98	34.7
" meal, decorticated, 7% " ..	7 15†	1 6	6 9	68	1 11	1.03	34.7
Coconut cake, 6% oil	6 12	0 16	5 16	77	1 6	0.80	16.4
Ground-nut cake, decor., 6-7% oil " " " imported, ...	7 5	1 6	5 19	73	1 8	0.89	41.3
" " " decorticated, 6-7% oil	6 17	1 6	5 11	73	1 6	0.80	41.3
Palm-kernel cake, 44-54% oil ..	6 7†	0 11	5 16	73	1 7	0.85	16.9
" " " meal, 44% oil	6 7†	0 11	5 16	73	1 7	0.85	16.9
" " " meal, 1-2% oil	5 17	0 11	5 6	71	1 6	0.80	16.5
Feeding treacle	5 0	0 7	4 13	51	1 10	0.98	2.7
Brewers' grains, dried ale	5 15	0 10	5 5	48	2 2	1.16	12.5
" " " porter	5 7	0 10	4 17	48	2 0	1.07	12.5
Dried sugar-beet pulp (a)	5 7	0 5	5 2	66	1 7	0.85	5.2

(a) Carriage paid in 5 ton lots. *At Bristol. ‡At Hull. †At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 19s. per ton as shown above, the food value per ton is £9 1s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.19s. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 10d.; P₂O₅, 2s. 1d.; K₂O, 2s. 11d.

FARM VALUES OF FEEDING STUFFS

Farm Values. —The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	7 3
Maize	78	7.6	5 7
Decorticated ground-nut cake ..	73	41.3	7 1
„ cottonseed cake ..	68	34.7	7 12

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.73 shillings, and per unit protein equivalent, 0.91 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1934, issue of the Ministry's JOURNAL, p. 808.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 13
Oats	60	7.6	5 11
Barley	71	6.2	6 8
Potatoes	18	0.8	1 12
Swedes	7	0.7	0 13
Mangolds	7	0.4	0 12
Beans	66	19.7	6 12
Good meadow hay	37	4.6	3 8
Good oat straw	20	0.9	1 15
Good clover hay	38	7.0	3 12
Vetch and oat silage	13	1.6	1 4
Barley straw	23	0.7	2 0.
Wheat straw	13	0.1	1 3
Bean straw	23	1.7	2 1

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

Rothamsted Annual Report, 1933

THE Report of the Rothamsted Experimental Station* is an annual publication of considerable interest to those who are concerned with the technical aspects of agriculture. For some readers the conclusions drawn from the year's experiments will suffice, but an increasing number will turn to the section dealing with the design and presentation of the results of the experiments and the use of tests of significance.

The Report consists of two sections, one dealing with field experiments in fertilizer and cultivation problems at Rothamsted, Woburn, and other centres in various parts of the country, the second summarizing the laboratory investigations, details of which are to be found in the 52 scientific papers and 29 technical papers published in 1933.

In recent years uniform schemes of field experiments conducted at a number of centres have largely taken the place of the isolated trial, and the present report contains summaries of three series of this class. One deals with the results of 10 years' experiments on malting barley, a second sets out the first year's results of an investigation of the fertilizing value of poultry manure, and the third deals with the effect of fertilizers on the yield and quality of sugar beet. A useful review of 10 years' fertilizer experiments on potatoes has been included, and a condensed summary of the main findings of 50 years' work at the Woburn experimental farm.

A comprehensive study of the determination of manurial requirements of field soils by means of laboratory tests is in progress with the aid of data derived from the results of the accredited fertilizer experiments conducted in recent years. A study of cultivation problems in the field is being made by the staff of the Physical Department, an aspect in agriculture that assumes increasing importance as farm mechanization proceeds. Two aspects of the question in particular are receiving attention. Rotary cultivation,

* Rothamsted Experimental Station Annual Report, 1933. Pp. 200. Obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, Herts. Price 2s. 6d.

MISCELLANEOUS NOTES

being fundamentally different in its action from traditional methods, is being studied in relation to the nature of the tilth produced and its effect on the germination and growth of the crop. Another important series of experiments tests intensive against normal cultivations, the latter being just sufficient to suppress weeds. Up to the present no definite benefit has resulted from the extra stirring of the soil.

The study of the purification of effluent waters for agricultural industries, successfully undertaken by the Microbiological and Fermentation Departments in regard to beet-sugar factory effluents, has now been extended to the more difficult problems of milk factory effluents. Work on virus diseases continues, and a detailed investigation of the causes in the fluctuation of insect populations is now in progress. Problems of bee management have been studied at Rothamsted for some years. At the request and with the active support of practical beekeepers this work has been extended to include the investigation of bee diseases, and a start has been made on the serious and obscure brood diseases of which the European and the American Foul Brood are the most important. In the Insecticide Department important studies on pyrethrum and other vegetable poisons are reported. The crops themselves can be produced in the tropical or temperate parts of the Empire.

The Report contains a section by Prof. R. A. Fisher, formerly head of the Statistical Department, dealing with the contributions of Rothamsted to the development of statistical science. This work has had a profound influence on the design and interpretation of biological experiments and the field arrangements developed are in use all over the world.

In 1933 a beginning was made in the study of the technique of feeding experiments. An account is given of an experiment on pig management designed to test the possibility of applying to animal experiments the methods that have been so successful in modern field trials. 'Conclusive results were obtained, showing the necessity of green food for the growing pig, and the advantage of wet over dry feeding.

Milk Yields of Goats in 1934

THE year 1934 was remarkable for milk yields of goats. As stated in the issue of this JOURNAL for August last, a record yield for 24 hours was established on May 23 by a

MISCELLANEOUS NOTES

goat which gave 21 lb. 10 oz. This record was beaten on July 18 by a yield of 22 lb., and again on July 25 by a yield of 22 lb. 7 oz. Towards the close of the season it was announced that the previous maximum yield for a recorded year had been exceeded by 255 lb. 2 oz. Milking competitions were held at 29 shows, and on seven different occasions a yield of 20 lb. or over was obtained. The following figures show a steady increase in the number of goats recorded as yielding from 10 lb. to 15 lb. in 24 hours:—

<i>Year.</i>	<i>Number of Goats.</i>
1928	92
1929	118
1930	143
1931	110
1932	161
1933	185
1934	214

The records now stand as follows:—

R₄ BITTERNE PENELOPE Q*, 24 hours: 22 lb. 7 oz.

R5 BORDEAUX MARLENE *Q*Q*, annual yield: 5,306 lb. 1 oz.
First kidder: 18 lb. 6 oz.

R₄ DIDGEMERE DIXIE Q**Q*, Royal Show: 18 lb. 2 oz.

Maximum number of points at any show : 42.56.

R4 DIDGEMERE DOGGEREL *Q*Q*Q***Q*, Dairy Show: 16 lb.

R₄ Ch. MOSTYN MARIGOLD Q*Q*, 5 years' yield: 22,035 lb. 15 oz.

Average annual yield per recorded quinquennium: 4,407 lb. 3 oz.

Advisory Leaflets

SINCE the date of the list published in the November, 1934, issue of this JOURNAL (p. 810), the undermentioned Advisory Leaflets have been issued by the Ministry: --

- No. 9. The Purchase of Insecticides and Fungicides (Revised).
 No. 223. Methods of Eradicating Bovine Tuberculosis from Herds.
 No. 224. The Red Spider Mite (*a*) Glasshouse Crops.
 No. 225. Cutworms or Surface Caterpillars.
 No. 226. The Red Spider Mite (*b*) Crops in the Open.
 No. 227. Mangolds.
 No. 229. The Goldfinch, the Chaffinch and the Greenfinch.
 No. 231. The Spotted Flycatcher.

Copies of any of the above-mentioned leaflets can be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Sale Offices of that Department at Edinburgh, Manchester, Cardiff and Belfast, price 1*d.* each net (1½*d.* post free), or 9*d.* net per doz. (10*d.* post free).

Single copies of not more than 20 leaflets can, however, be obtained, free of charge, on application to the Ministry. Further copies beyond this limit must be purchased from H.M. Stationery Office, as above.

MISCELLANEOUS NOTES

A list of the Ministry's publications, including leaflets, on agriculture and horticulture can be obtained free and post free on application to the Ministry.

The Agricultural Index Number

THE general index number for December of the prices of agricultural produce was 113 (the corresponding month of 1911-13 = 100) or 1 point lower than in November and 3 points higher than in December, 1933, and 10 points above that for December, 1932. (If allowance is made for payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act, the index for December, 1934, would be 121.) Numerous changes in prices were again evident during the month under review, but they were generally of a small character. The most considerable alterations were a decline in potato and egg prices and a rise of 1*d.* per gallon in milk. Fat sheep and pigs were a little dearer, while fat cattle values on average were only slightly above those ruling in November.

Monthly index numbers of prices of Agricultural Produce.
(Corresponding months of 1911-13 = 100.)

Month.	1929.	1930.	1931.	1932.	1933.	1934.
January	145	148	130	122	107	114
February	144	144	126	117	106	112
March	143	139	123	113	102	108
April	146	137	123	117	105	111
May	144	134	122	115	102	112
June	140	131	123	111	100	110
July	141	134	121	106	101	114
August	152	135	121	105	105	119
September	152	142	120	104	107	119
October	142	129	113	100	107	115
November	144	129	112	101	109	114
December	143	126	117	103	110	113

Grain.—Wheat at an average of 4*s.* 10*d.* per cwt. was 1*d.* cheaper on the month, but as the decrease between November and December of the base period was proportionately larger, the index at 66 was unaltered. (If allowance is made for "deficiency payment" under the Wheat Act, 1932, the index would be raised to 130.) Barley was 3*d.* per cwt. cheaper during December at 8*s.* 7*d.* per cwt., but the index at 104 showed no change as the drop in prices in the base years was relatively the same. Oats at 6*s.* 8*d.* per cwt. were 1*d.* dearer and the index appreciated by 1 point to 95. In December last year, wheat averaged 4*s.* 6*d.*, barley 9*s.* 2*d.* and oats 5*s.* 3*d.* per cwt., the indices being 61, 111 and 75 respectively.

MISCELLANEOUS NOTES

Live Stock.—Fat cattle, which normally show a substantial rise in average price in December, were only very slightly dearer than in November, and the index this December declined by 6 points to 90. (The effect of adding the cattle subsidy would be to raise the index to 103.) Values for fat sheep were a little higher than in the preceding month, but as the rise was proportionately smaller than in the base years, the index fell by 4 points to 19 per cent. above 1911-13. Second quality bacon pigs at 10s. 8d. and porkers at 13s. 6d. per score were dearer by 4d. and 8d. respectively, and the index for baconers advanced by 4 points to 107, while that for porkers was 6 points higher at 124. A small decrease was noticeable in the price of dairy cows, and the index was 2 points lower at 103, while store cattle also were a shade cheaper, the index falling 1 point to 82. Store sheep sold cheaper during December and the index was 8 points lower at 99. On the other hand, store pigs were dearer and the index rose 1 point to 148, which compares with a figure of 147 at the corresponding date last year.

Dairy and Poultry Produce.—In all regions the wholesale contract price for liquid milk was 1d. per gallon higher than in November, which caused the index to advance 10 points to 171. Between November and December, 1933, the index rose by 5 points to 166. The seasonal upward movement in butter prices continued during December, but as this increase of $\frac{1}{2}$ d. per lb. was relatively smaller than that recorded in the base period, the index declined 1 point to 82. Eggs, as is usual at this time of the year, were much cheaper, prices being 4d. per dozen lower than in November, with a consequent fall of 14 points in the index to 97, as compared with a figure of 99 a year ago. Quotations for cheese showed little material change during the month under review, and the index remained stationary at 93. On account of the seasonal demand, prices for poultry were higher, but, as the increases in the base years were more pronounced, the combined index was 4 points lower on the month at 110, which is the same as that recorded in December, 1933.

Other Commodities.—During December prices of potatoes showed a further decrease, the index declining 13 points to 133; a year ago the index was 112. Clover hay was a trifle dearer on the month, but meadow hay was unchanged and the combined index was unaltered at 104. Wool also was

MISCELLANEOUS NOTES

unchanged, but the index declined by 1 point to 84 owing to a slight rise in prices in the base period. The index for apples was 8 points lower at 87, while vegetables were cheaper, the index declining 14 points to 102.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1932	1933	1934			
	Dec.	Dec.	Sept.	Oct.	Nov.	Dec.
Wheat	72	61	68	67	66	66
Barley	84	111	127	111	104	104
Oats	81	75	98	94	94	95
Fat cattle... ..	101	97	104	97	96	90
„ sheep... ..	91	106	124	128	123	119
Bacon pigs	92	109	102	99	103	107
Pork „	103	126	109	112	118	124
Dairy cows	114	106	105	107	105	103
Store cattle	103	85	88	85	83	82
„ sheep	72	86	113	114	107	99
„ pigs	108	147	142	143	147	148
Eggs	92	99	103	115	111	97
Poultry	115	110	117	116	114	110
Milk	155	166	168	161	161	171
Butter	98	97	87	84	83	82
Cheese	114	106	94	93	93	93
Potatoes	120	112	158	151	146	133
Hay	67	80	104	101	104	104
Wool	62	84	87	85	85	84

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	134	130	127	128	127	130
Fat Cattle... ..	—	—	119	112	110	103
General Index	107	114	126	122	121	121

The National Diploma in Agriculture

THE 36th annual examination for the National Diploma in Agriculture will be held, under the auspices of the National Agricultural Examination Board, at Leeds University, on Tuesday, April 9, 1935, and following days. To be eligible for admission to the examination, candidates must present certificates from a recognized college for the subjects of General Botany, General Chemistry, Geology, Physics and Mechanics; and, before the Practical Agriculture and Farm Machinery Papers are taken, candidates must also produce evidence of having resided on a farm for a complete year of farming operations. Applications for permission to sit for the examination must be sent in

MISCELLANEOUS NOTES

not later than Wednesday, February 20, 1935. Particulars may be obtained from the Secretary, Royal Agricultural Society of England, 16, Bedford Square, London, W.C.1, or from the Secretary, Highland and Agricultural Society of Scotland, 8, Eglinton Crescent, Edinburgh 12.

Some Wireless Talks to Farmers in February

<i>Date: February</i>	<i>Station</i>	<i>Time</i>	<i>Speaker</i>	<i>Subject</i>
6, 13, } 20, 27 }	National	6.45 p.m.	Mr. John Morgan	Topics of the season
7	Northern	6.30 p.m.	Major C. W. Tomkinson and Mr. W. B. Mercer	A Landowner's Experience of Farming. Discussion
21	"	"	Professor J. A. Hanley, Mr. W. Lyle Stewart and Mr. Geo. Robson	Discussion. Modern Views of Sheep Diseases and their effect on Husbandry
7	Midland	7.15 p.m.	Mr. W. B. Thompson	For Midland Farmers
21	"	6.30 p.m.		
14	Western	"	Mr. A. W. Ling, Mr. Tony Cory and Mr. Pat Ryder	Mr. "Cory" and Mr. Ryder will tell Mr. Ling how they run their farm in the Cotswolds
28	"	"	Mr. A. W. Ling and members of two branches of the Young Farmers' Clubs	Discussion. What are the Young Farmers Doing?
8	Scottish	6.40 p.m.	Mr. W. G. R. Paterson	For Scottish Farmers in Particular
22	"	6.30 p.m.		
14	"	"	Dr. J. Russell Greig	"Louping" Ill, Braxy & Lamb Dysentery
28	"	7.15 p.m.	Mr. W. M. Findlay	Early and Late Sowing of Cereals
8	Northern Ireland	7 or 7.15	Mr. E. V. B. Wilson	Cereal and Flax Trial Results for 1934
15	"	"	Mr. J. Algie	Hints from Results of Recent Crop Experiments
22	"	"	Mr. Peter Fitzpatrick	Farmers' Work and Worry

International Poultry Exhibition, Paris, 1935.—The Seventieth International Exhibition organized by the Société Centrale d'Aviculture de France will take place in Paris from February 14 to 19 next. This exhibition, which is among the most important of its kind to be held on the Continent, will include classes for live and dressed poultry, ducks, geese, turkeys, pigeons, cage- and aviary-birds, rabbits for fur and flesh, as well as a large variety of appliances for breeding and rearing. Numerous prizes will be awarded, including a valuable work of art presented by the President of the Republic. A programme containing full details of the exhibition, conditions of entry, etc., may be obtained on application to the Secretary, Société Centrale d'Aviculture de France, 34 rue de Lille, Paris (VIIe).

APPOINTMENTS

Enforcement of Minimum Rates of Wages— During the month ending January 14, 1935, legal proceedings were taken against seven employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area.	Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
		£ s. d.	£ s. d.	£ s. d.	
Lancs.	Middleton	1 0 0	—	2 0 0	1
Derby	Ashbourne	4 0 0	2 6	7 0 0	1
Monmouth	Newport ...	*	2 12 0	14 0 0	2
Yorks, E.R.	Market Weighton	4 8 6	11 6	11 0 0	1
Carmarthen	St. Clears...	1 0 0	2 6	25 3 0	1
Pembroke	Pembroke	*	—	5 1 4	1
Rutland	Oakham ...	1 0 0	10 0	5 11 2	2
		£11 8 6	3 18 6	69 15 6	9

* Dismissed under Probation of Offenders Act.

APPOINTMENTS

Ordnance Survey

The Minister of Agriculture and Fisheries, with the approval of the Army Council, has appointed Brigadier M. N. MacLeod, D.S.O., M.C., to be Director-General of the Ordnance Survey in succession to Brigadier H. St. J. L. Winterbotham, C.B., C.M.G., D.S.O., A.D.C., who retires from the Service on February 5, 1935.

County Agricultural Education Staffs

ENGLAND

Buckinghamshire.—Mr. J. N. Acaster has been appointed Assistant Instructor in Horticulture, *vice* Mr. W. R. N. Barnett, C.D.H.

Lancashire.—Mr. O. J. Pattison, M.Sc., N.D.A., has been appointed District Agricultural Organizer, *vice* Mr. G. F. Kingston, M.A.

Suffolk (East).—Mr. A. W. Punter, B.Sc. (Agric.), N.D.A., N.D.D., has been appointed County Dairy Instructor and Assistant Agricultural Organizer.

Staffs of the Agricultural Research Institutes

Rothamsted Experimental Station

Mr. J. R. Moffat, B.Sc. (Agric.), N.D.A., has been appointed Farm Manager, *vice* Mr. H. G. Miller, deceased.

Studley College, Warwickshire

Miss D. M. S. Brown, B.Sc., A.R.C.Sc., has been appointed Lecturer in Zoology and allied subjects.

Miss J. M. Ritchie, N.D.D., has succeeded Miss F. G. Crosthwaite, N.D.D., as Assistant Instructress in Dairying.

NOTICES OF BOOKS

The Hop Industry. By Hubert H. Parker, B.Sc. (Econ.), Ph.D. Pp. viii+327, and 9 Figs. (London: P. S. King & Son, Ltd. 1934. Price 15s.)

There is only one crop that lends itself to isolation from the general routine of farming, and consequently it is impossible to anticipate a series of monographs upon the various branches of the industry. The branches are too closely connected and too interdependent to allow of their separate treatment, although the trend of modern development may seem to negative this assumption in some degree.

Dr. Parker has been fortunate in his selection of a subject. Not only can hops be regarded as a separate department of the farm, even where they are only an item of the produce of the farm, but the crop can only be used commercially for one purpose, and thus its marketing does not present the complexities surrounding other farm produce.

The book itself has been well planned, and is clearly written. It has also the merit of demonstrating the value of historical research as the basis of the study of current problems. Its opening chapters discuss in some detail the history of hop-growing in this country up to the end of the 19th century, while the rest of the book describes the modern position of the industry and the methods and problems of collective marketing.

Naturally Dr. Parker depends largely upon the authority of contemporary didactic writers for his outline history of the industry, and is only able to supply costs of production from about the end of the 18th century, although he indicates that the profits of hop-growing (when there were any) were probably always on a large scale. The development of methods of cultivation is closely followed and the author also gives an account of the changes in the distribution of the area of the crop until it coalesced in the modern districts.

Fascinating as this aspect of the subject is, however, it is probably in the last section of the book that modern growers and brewers will find most interest. This section touches upon their own problems and sums up the post-war attempts to organise the industry, culminating in the formation of the Hops Marketing Board.

The book is pleasantly illustrated and adequately supplied with maps and informative tables. It should be of service not only to those immediately concerned in the industry, but also to students of agricultural history and economics.

Hooton Pagnell: The Agricultural Evolution of a Yorkshire Village. By A. G. Ruston, D.Sc., B.A., D. Witney, B.Com. Pp. vi+459, and 74 Figs. (London: Edward Arnold & Co. 1934. Price 25s.)

Relics of past systems of tenure and farming are found in many villages, and often form inconveniences to those who wish to adopt the most modern methods of farming; but since these inconveniences are age-old and customary, perhaps they are hardly noticed until the necessity for change arises. Hooton Pagnell provides evidence of survival from a forgotten past in the distribution of the fields of its holdings and in some other respects. That forgotten past is now brought back to memory by this exhaustive study of the surprisingly continuous available muniments relating to the manor and parish.

Beginning with Domesday and ending to-day, the history of the village is presented against a background of the general agricultural history of the country. The paramount importance of enclosure causes that subject to be dealt with in an early chapter; systems and methods of farming are discussed in detail, ownership and land tenure are treated, and the development of tenant right as well as the

NOTICES OF BOOKS

incidence of title and the ownership of the glebe are fully examined.

It would be difficult to isolate for application to a particular village such general incidents of the administration of the country as a whole, but the thread of the story of Hooton Pagnell is here so intertwined with that of the general background that it is not always easy to follow. The plan of the book might have been simpler if our attention had been exclusively directed towards Hooton Pagnell, because evidence drawn from other and sometimes far-removed villages is not necessarily adducible. In their anxiety to complete the story our authors have confused the issue, so that the reader is made to wonder whether the work has been designed as a general textbook on the development of farming with special reference to Hooton Pagnell records, or as what its title claims it to be.

It is a little difficult to follow many of the general statements. Few modern historians would be inclined to accept the description of mediæval people on p. 62, and the 8-ox team is now regarded as a convention. The actual team necessarily varied with different soils and different operations, and 8 oxen were far from constituting an unvarying plough unit. Hooton Pagnell seems to have been a three-field village, but there is some doubt whether the three-course rotation was as rigid as it is here said to be. That it was capable of amendment is shown by the cultivation of clover implied in a lease of 1757 and by the agreement of 1781 whereby turnips might be grown on the fallow field.

Some interesting documents relating to enclosures of waste for arable in the 17th century are reproduced in full, while a survey of 1648 supplies pretty clear evidence that there was no uniformity in the size of holding at that time.

Drawings from the Luttrell Psalter are reproduced as illustrations of farming processes in the Middle Ages with perhaps more justice than they were by Sir George Sitwell to illustrate his "Tales of my Native Village," and there are copious other illustrations. Many of the statistical data are depicted in diagrams, and many extracts from contemporary maps serve to clarify the argument relating to enclosure and to the passing of the open fields.

An Introduction to Plant Biochemistry. By Catherine Cassels Steele, M.A., B.Sc., Ph.D. Pp. viii+356 and 12 Figs. (London: G. Bell & Sons Ltd. 1934. Price 15s.)

Plant biochemistry is overshadowed by animal biochemistry, which in point of fact is often pathological biochemistry. Biochemical textbooks that deal adequately or fully with the plant and plant products are all too few. This book is therefore a welcome addition in this field. The preface states that its aim is "to provide students of botany with an introductory account of the chemical nature and relationships of the substances elaborated by plants."

Students of botany, like students of medicine, frequently receive inadequate training in the fundamentals of organic chemistry, and to meet their needs, and the needs of those without knowledge of organic chemistry, the book is arranged logically, simple compounds being placed first, and then those that are more complicated. It is questionable, however, whether this divided aim is worth while. To teach organic chemistry by using examples from biological materials is very desirable, but to attempt to teach at one and the same time elementary organic chemistry and moderately advanced biochemistry is to attempt too much, and presupposes abnormal ability in the student. In the field of animal biochemistry, several books have been written with the same dual purpose (e.g., Plimmer's well-known *Organic and Biochemistry*), and none has been really successful. Fortunately, it is not the biochemical aspect that suffers in this instance.

The various groups of plant compounds are dealt with in some detail, and the botanical sources quoted wherever possible. This last

NOTICES OF BOOKS

is rather unusual in a text-book. Brief summaries of the physiological functions of some of the groups discussed are interpolated, and in general are adequate, though there are exceptions. A parallel "course" of simple experiments, modest in regard to apparatus and time required for their execution is included. Most of these experiments do not require much in the way of mental equipment.

The closing chapters deal broadly with the metabolism of the plant—photosynthesis, nitrogen metabolism, respiration and growth—and provide a good, if somewhat concentrated, outline of modern views. There is a bibliography of books (not research papers) and two good indexes, cross-referenced, one to botanical names, and the other to general subjects and authors.

The presentation throughout is clear and concise, and the book is likely to be of real value in the training of botanists, since the texts available in biochemistry are so few.

Genetik und Tierzüchtung: Handbuch der Vererbungswissenschaft, Band III. (*Genetics and Animal Production*). By C. Kronacher. Pp. vi + 280, 61 illustrations and diagrams. (Berlin, W.35: Gerbrüder Borntraeger, Schöneberger Ufer 12a. 1934. Price, for the complete work, RM. 37.50.)

This volume (Part III) gives an account of the genetic experiments that have been made on farm animals, and forms a reference book for those who may want to be informed as to the present state of knowledge on this subject. It is divided into three main sections. The first is a general introduction (pp. 1-9) with a short historical account of breed improvement, from the horses of the Assyrians and the beef cattle of ancient Egypt to the early-maturing breeds developed by Bakewell and Collings, and the latest theories on the constancy of the germ plasm, mutations and Mendelism.

The second part (pp. 10-40) is an account of the general influence of the newly-discovered laws of inheritance on the methods of animal breeding. Among the various points discussed are the effects of inbreeding, heterozygous vigour, combination types between species, identical twins, Mendelian factors and genes, and the physiological development of characters.

The third main section, which is again divided into three sub-sections, forms a large part of the book. Sub-section 1 deals with the details of inheritance of the different characters in each species, and includes fairly complete references to the literature of the subject (pp. 192-279). For the most part, these consist of fancy points or mutations, such as coat colour, lethal factors, ear length, etc. Among other characters dealt with are: in horses (pp. 41-46) body conformation and blood groups; in cattle (pp. 46-62) the production of milk and butter fat, and the author points out that the similarity in the udder shape of identical twins is evidence for its inheritance; in sheep (pp. 62-68) teat number, wool quality and fertility; in pigs (pp. 71-87), on which the author himself has done considerable work, teat number, body proportions and fertility; while, in goats (pp. 68-71), rabbits (pp. 88-91) and poultry (pp. 91-94) many other characters are also discussed.

Section three, Sub-section two, is, perhaps, the most interesting because of its economic importance: it deals with methods and suggestions for extended research (pp. 95-154). There is a discussion on the methods of breeding for milk: and the problem of "Doppel-lender" calves, in which the muscles of the rump and loin are enlarged (giving them a high value for veal) is considered in detail. Questions of rachitis in heavy horses, and snuffles in pigs are also discussed from the genetic point of view.

The third and last sub-section of this third main section contains the applications of the scientific knowledge of inheritance to the practice of breeding farm animals (pp. 155-184); the effects and uses of inbreeding are discussed, and an account given of breeding for

NOTICES OF BOOKS

immunity and resistance to disease, e.g., the crosses between cattle and the Zebu which produce types suitable for tropical and sub-tropical climates where disease is rife. Experiments on the crossing of the Leghorn, with a high resistance, and the Faverolle, with a low resistance to Coccidiosis, and the supposed association of the wild colour in pigs with resistance to swine fever, are also discussed, as well as resistance to tuberculosis and abortion. An account is also given of the methods of correcting milk yields for age, dry period, etc., in order to obtain a better measure of the genetic value of the cow, and of the methods in use for testing the breeding value of bulls by progeny tests.

In his concluding remarks, the author alludes to the importance of the study of the development of economic characters, and their explanation in terms of internal secretions, etc., which will assist both the practical breeder and the geneticist in the solution of their problems.

The Practice and Science of Bread-Making. By D. W. Kent-Jones, Ph.D., B.Sc., F.I.C. Pp. 184 and 36 plates. (Liverpool: The Northern Publishing Co. Ltd. 1934. Price 7s. 6d.)

Dr. Kent-Jones is a well-known authority on bread-making, and this volume should find a wide circulation. No attempt has been made to deal with highly technical matters in great detail, but the elementary student, practical baker and general reader will find in this work a large amount of information in a form that can be readily understood.

The author deals briefly with a wide variety of subjects, ranging from types of wheat to the legal position of the baker. Those engaged in the industry will find the chapter describing bread faults particularly instructive, and the references to the Scottish and Irish methods are of considerable interest.

The general reader will be impressed with the amount of technical skill and experience required by the modern baker, in spite of the mechanization that has been introduced to the industry in recent years. The text is supplemented with a variety of plates that clearly demonstrate the arguments of the author. As an introduction to bakery technique, this volume serves a very useful purpose, particularly as the amount of literature of this description is very limited.

Economic Plants. By E. E. Stanford, Ph.D., Professor of Botany, College of the Pacific. Pp. xvi+571, and 376 Figs. (New York and London: D. Appleton-Century Co., Inc. 1934. Price 21s.)

As stated in the preface, this book is intended primarily as a text-book in economic botany, but it should appeal to those of the general public who are interested in the uses of plants. While special attention is devoted to plants that are of importance on the American continent there is also much of interest regarding plants of value to man in other countries. The subject matter is dealt with in a readable, popular style, and a special feature of the work from the general reader's point of view is the large number of excellent illustrations and photographs that are included in the text. These have been for the most part reproduced from publications of the United States Bureau of Plant Industry.

The first two chapters, occupying 68 pages, are devoted to elementary plant anatomy and descriptions of plant organs and tissues. As matters of this sort are fully dealt with in general text-books on botany, of which there is no dearth, it may be suggested that the space might have been better utilized if devoted to certain important economic plants that have been omitted altogether. It is difficult to understand why no reference is made to the tobacco plant, especially as tobacco is such an important crop-plant in the United States and is now in daily use in most countries. In the chapter on fruits no mention is made of the banana—now in the front rank of the world's

NOTICES OF BOOKS

commercial fruits. Among other important fruits that are not mentioned are the date, avocado, mango, paw-paw, and passion-fruit. Other noticeable omissions are among food plants, some of which constitute the staple food of certain peoples. These include cassava (*Manihot* spp.), yam (*Dioscorea* spp.), sweet potato (*Ipomoea batatas*), dasheen (*Colocasia* spp.), and arrowroot (*Maranta arundinacea*). In the chapter devoted to medicinal plants the only drug plants dealt with are opium, coca, cinchona, cascara and ginseng. Culinary vegetables and vegetable dyes, the latter admittedly of less importance now than formerly, are omitted. It is realized that it may be impossible to deal with all the economic plants of the world in a single volume, but it is felt that omissions of the type indicated and the lack of a bibliography or references to literature may somewhat lessen the value of the book as a work of reference.

Chapters likely to be of special interest to agricultural readers in this country are those on cereals and allied crops, textile plants, protein products (including pulses and edible nuts), sugar and sugar plants (including sugar beet), and forest products. Altogether the volume contains a great deal of useful and interesting information on the plants of every-day life.

Virus Diseases of Plants. By John Grainger. (Oxford University Press. London: Humphrey Milford. 1934. Price 6s.)

This small book of just over one hundred pages is designed to serve as a simple text-book for the student of Mycology or Plant Pathology—to introduce to him the phenomena associated with virus diseases and not to provide descriptions of all known diseases of this type. Following the introductory historical chapter there are five chapters that deal with the relation of a virus to its host plant, the properties of the virus extract, the relation of insects to virus diseases, the economic effects and measures of control, and the classification and description of virus diseases. The seventh and last chapter covers general experimental work. There is appended a long list of references to literature, covering no less than four hundred and forty-five items. This would seem a little too ample for the needs of the average student, and a judicious selection of the most important contributions to the subject would probably have been more serviceable. The treatment is, perhaps necessarily, somewhat curt in style, and the selection of diseases chosen for consideration on account of their special characteristics and economic significance might easily have been a better one. Of the half-dozen dealt with, two (Aster Yellows and Sandal Spike) are not likely to be encountered by students in this country. That the author, like so many writers on virus matters, does not clearly distinguish between cause and effect is evident when a cross-heading reads, "Potato Crinkle—a composite virus." A list of the insect vectors of some eight virus diseases is provided, but it may be doubted whether the whole of the twelve species of insects included under Potato Leaf-Roll are of really practical significance, even if, indeed, all of them have been proved incontestably to be capable of transmitting the virus of this disease. As illustrations the book contains five clear diagrammatic figures in the text and six plates of half-tone photographic reproductions. If the potato plant illustrated on the left at the bottom of Plate VI was really healthy, its photograph would seem to belie the fact! Whilst it can scarcely be said of this little book that it supplies a definite want, yet it may perhaps be found serviceable within limits.

The Pig-Keeper's Pocket Book and Diary, 1935. Edited by W. O'Connell Holmes. Pp. 176. (London: W. O. Holmes, 51, Whittington Road, N. 22. Price 1s. 6d.)

"Pocket books" are sometimes rather large for the average pocket, but this little brochure deserves its title, and contains withal practical information concerning such matters as breeds, breeding,

NOTICES OF BOOKS

dentition, diseases, farrowing, feeding, housing, legislation, rations, weaning and weighing. The charts and tables will be found particularly useful for rapid reference by the busy pig-keeper.

Memories at Eventide. By Sir Edward Brown, LL.D., F.L.S. Pp. xi + 271, and 8 figs. (Burnley: John Dixon, Ltd., Stanley Street. 1934. Price 6s.; edition de luxe, 8s. 6d.)

This volume records the history of some of the events that have led to the development and organization of the poultry-keeping industry. In many respects the author may be said to occupy a unique position in the poultry world, and, after a lifetime spent in service to the industry, his experiences cannot fail to be of interest to poultry-keepers in all countries. The opening chapters record continuous efforts made in early years to awaken an interest in the economic possibilities of poultry-keeping. Before the War, poultry was a much-neglected Cinderella of agriculture, and was thought by many to be a mere pastime of little national importance, mainly concerned with the production of fancy breeds of birds whose chief place was on the show bench. It was with great determination, and, in the beginning, with scant encouragement that the author succeeded in surmounting opposition to the development and expansion of commercial poultry farming. To-day he may look back with legitimate pride on those first small beginnings and realize that his labours, so generously and ably given, have not been in vain.

The book is written in a clear and concise style and gives the reader a well-defined picture, coloured by many amusing anecdotes, of the work done by early pioneers in bringing about a complete change in outlook as regards the value of poultry products as an important addition to our national food supplies.

The closing chapters contain an account of the realization of Sir Edward's chief ambitions, viz., the establishment of an international organization known as the World's Poultry Science Association, of which he was the first President. It was through this Association and the powerful influence of its President that such international Congresses and Exhibitions as the World's Poultry Congresses came into being. These Congresses and Exhibitions have been held triennially since 1921. At home, after the strife and turmoil of the Great War, Sir Edward Brown's efforts met with equal success in establishing a National Poultry Council in 1920. After the termination of his presidency of the Council in 1920-21, Sir Edward became its Honorary Secretary, and held the post until his retirement in 1932. Every page of the book bears testimony to the notable service rendered by its author to the poultry industry generally, but perhaps more especially to the development of poultry education and research throughout the country; while the results of his labours have been of international value.

Our Garden Birds: Their Food, Habits and Appearances. By H. Mortimer Batten. Pp. 192, 39 colour plates and 6 diag. (London & Edinburgh: T. Nelson & Sons, Ltd., and T. C. & E. C. Jack, Ltd. 1934. Price 5s.)

A book by such a well-known naturalist as Mr. Batten is always worthy of respect, and is usually opened with pleasurable anticipation. In the present instance the reader's expectation is amply realized. This volume is a great improvement on the usual type of "Garden Birds" publication, which is often of the "talkie-talkie" style with a distressing disregard of the facts of ornithology. Throughout, this work bears the stamp of authority and gives evidence of first-hand knowledge and competent observation. It is, moreover, very pleasantly written. The author's views on the protection of birds are sensible and well-balanced, and are to be commended to some protectionists whose ideas are the reverse.

NOTICES OF BOOKS

Such criticisms as could be advanced would be confined to matters of detail, a case in point being the author's table of garden birds in which the species beneficial to man are marked with an asterisk. In this connexion one notes with some surprise the omission of distinguishing marks from the names of such birds as the Kestrel, the Tawny Owl and the Wren.

The illustrations are curiously uneven in merit. A few are poor, most are good, and some (notably those by Dr. Seaby) are first-rate. We have rarely seen a more beautiful drawing than his illustration of Lesser Spotted Woodpeckers. The book as a whole is an excellent five-shillings worth, and can be recommended to all who are lovers of birds and gardens.

Literatursammlung aus dem Gesamtgebiet der Agrikulturchemie. (*A Bibliographical List of the entire Domain of Agricultural Chemistry.*) Ed. by Prof. H. Niklas and Dr. A. Hock. Vol. III: Plant Nutrition. Pp. xlv + 1,114. (Weihenstephan bei München: Verlag der Bodenuntersuchungsstelle. 1934. Price R.M. 30.)

A notice of the first two volumes of this Bibliography appeared in this JOURNAL in April, 1933. The editors explain that the publication of the present volume has been unavoidably delayed owing to the difficult times through which their country has been passing. It is none the less welcome, and they promise the fourth volume on "Fertilization and Fertilizers" shortly.

It is unnecessary to divagate upon the service to scientists and students performed by the compilers of a comprehensive and up-to-date bibliography of this kind. It includes a wide range of periodical literature, and it is complete to the year 1932. Necessarily perhaps German publications predominate, but British, American and French work is included. Many foreign periodicals were, however, inaccessible, and it is therefore possible that deficiencies may be present, but it would appear from the list of sources that these are unlikely to be serious.

The arrangement of the entries has been simplified as far as possible. The four main divisions are (a) General; (b) Components and composition of the plant body; (c) Physiology of metabolism of plants; (d) The organization of agricultural experimentation. The short index enables the user to find the contents of the sub-chapters, and an enlarged index forms a guide to their contents. There are also subject and author indexes.

It is often difficult to classify works within the framework of any bibliography, because many dealing with a specific matter touch upon other subjects within the sphere of agricultural chemistry. In the text of this book, therefore, references are given to the first and fourth volumes, so that the individual volumes supplement each other. There can be no doubt of the value of this work, and since it is intended to publish supplementary volumes from time to time the whole will form a permanent body of reference to the wide field of science with which it deals.

Aménagement des Fumiers et des Purins. (*The Disposition of Animal Dung and Urine.*) By Prof. Max Ringelmann. 2nd Edition revised by P. Verchère. Pp. 227 and 110 figs. (Paris: Librairie Agricole de la Maison Rustique, 26 Rue Jacob, VIe. 1934. Price 7.70 fr.)

The work of Prof. Ringelmann needs no introduction to the readers of this JOURNAL, and this comprehensive little textbook on the management of farmyard manure will be useful to all who are concerned with the preservation and utilization of organic manures.

It covers the whole ground of its subject, and the instructions are presented in simple and effective language. The importance of organic manures is recognized, and here we find an ample guide to its careful

ADDITIONS TO THE LIBRARY

conservation and most adequate use. Keeping of animal solids in pits, piles and under cover is described, and there is some discussion of the best situation on the farm in which to construct the midden. The conditions and methods of application to the soil and crop are carefully discussed.

It is fairly certain that liquid manure is much more widely used upon the peasant farms of the Continent than in this country, and four chapters are devoted to this subject:—tanks, drainage into the tanks, pumping and the various types of pump, and the use of liquid manure. The making of artificial farmyard manure is not neglected, and is prefaced by a short history of the experiments that led to the possibility of making it.

The book is intended for the use of French farmers and is not designed for the scientist; it is a farmer's manual, and should form interesting reading for British farmers who can understand quite simple French.

Les Orchidées: Leur Culture. (*The Cultivation of Orchids.*)

By Dr. J. Gratiot. Pp. 170, and 49 figs. (Paris: Librairie Agricole de la Maison Rustique, 26 rue Jacob, VI^e. 1934. Price 10 francs.)

The author of this excellent little guide to the culture of orchids is well known in France and elsewhere as an authority on the subject. The opening chapters are devoted to a general description and classification of the orchid family. Subsequent pages deal adequately with the cultivation of the plant in conservatories, including their propagation and the control of various pests and diseases. Later the author makes the valuable suggestion that pots should not be used indiscriminately for various species without thorough cleansing or sterilization. The concluding chapters are perhaps the most valuable, for they contain an excellent account of the new method of raising seedlings in sealed culture tubes on sterilized media as now practised generally in the large commercial nurseries. Laboratory technique is accurately explained (although the instructions given could be readily understood only by those possessing some scientific training). There is also an account of the state of symbiosis that exists in the orchid family, which bears on the raising of seedlings in the laboratory by symbiotic methods, and is probably the first in popular form that has yet appeared. Although debatable statements concerning minor matters are found occasionally in this brochure, it may be commended as a thoroughly practical and useful publication, and one that will be of value to the amateur grower, the professional gardener and the student of horticulture. There is nothing in English to compare with it, and a translation would be welcome.

The Journal of the Orkney Agricultural Discussion Society. Vol. IX (1934). Pp. 67. (Obtainable from the Secretary, Agricultural College, Kirkwall, Orkney. Price 1s. 3d. post free.)

This annual publication from the far north contains articles on the Bacon Scheme, poultry for table purposes, the management of a small holding, reconstruction of farm buildings, lameness in horses, and other matters of practical importance to agriculturists generally. Reports of a debate and papers by junior members testify to the useful work which is being accomplished by this society in stimulating local interest in agriculture.

ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous

Street, A. G.—Land Everlasting. (x + 300 pp.) London: John Lane, The Bodley Head, Ltd. 7s. 6d.

A World List of Scientific Periodicals Published in the Years 1900-1933. (2nd Edn.) Oxford at the University Press; London: Humphrey Milford, 1934. £2 2s.

ADDITIONS TO THE LIBRARY

- Trades Union Congress.*—The Martyrs of Tolpuddle. (xv + 239 pp. + 3 pl.) London: The Trades Union Congress General Council, 1934. 7s. 6d.
- Economic Advisory Council.*—Report of Committee on Cattle Diseases. (Cmd. 4591.) (161 pp.) London: H.M. Stationery Office, 1934. 2s. 6d.
- Huxley, J.*—Scientific Research and Social Needs. (xvi + 287 pp. + 40 pl.) London: Watts & Co., 1934. 7s. 6d.
- Cunningham, A.*—Practical Bacteriology. An Introductory Course for Students of Agriculture. (203 pp.) (2nd Edition.) Edinburgh and London: Oliver & Boyd, 1934. 7s. 6d.
- Walter, K.*—Co-operation in Changing Italy. A Survey. (x + 80 pp. + 3 pl.) London: P. S. King & Son, 1934. 2s. 6d.
- Snelgrove, L. E.*—Swarming. Its Control and Prevention. (ix + 95 pp.) Published by the Author at Bleadon, Weston-super-Mare, 1934. 3s. 6d.
- Collings, G. H.*—Commercial Fertilizers. Their Sources and Use. (xiv + 356 pp.) Philadelphia: Blakiston, 1934. \$3.25.
- Rothamsted Experimental Station, Harpenden.*—Modern Changes in the Treatment of Light Soils, being the Report of a Conference held at Rothamsted on March 20, 1934, under the Chairmanship of Sir E. J. Russell, with contributions by Sir E. J. Russell, A. J. Hosier, W. Parker, A. W. Oldershaw and H. H. Mann. (34 pp.) Rothamsted Conference XVII, 1934. 2s.
- Académie Lénine des Sciences Agricoles de l'U.R.S.S.*—La Turquie Agricole (Parte Asiatique Anatolie) sous la rédaction de N. Vavilov. (xxvi + 908 pp. + 381 figs. + 12 plates + 1 map). Summary in French. Moscow and Leningrad, 1933.
- Midland Agricultural College.*—Bulletin No. 31: Record of Farming Practice and Guide to Experiments on the College Farm, 1934. (55 pp.) Sutton Bonington, 1934.
- Ministry of Agriculture and Fisheries.*—Economic Series No. 40:—Abattoir Design. Report of Technical Committee. (xii + 46 pp. + 2 diagrams.) London: H.M. Stationery Office, 1934. 1s.
- United States Department of Agriculture.*—Miscellaneous Publication No. 88: The United States Department of Agriculture—Its Structure and Functions. (177 pp.) Revised, Washington, 1933.
- L'Institut International d'Agriculture.*—Le développement intégral de son activité. (80 pp.) Rome, 1933.
- The Model Abattoir Society.*—Slaughter House Reform, by J. H. Jones. Lecture delivered before the Model Abattoir Society in Nov., 1933. (32 pp.) London, 1933.
- West Suffolk Agricultural Committee.*—Agricultural Education Sub-Committee. The Bacon Pig, by R. Sayce. (37 pp.) Bury St. Edmunds, 1934.

Agricultural Economics

- University of Cambridge, Dept. of Agriculture.*—Farm Economics Branch, Report No. 22:—An Economic Survey of Agriculture in the Eastern Counties of England, 1933. (vi + 77 pp.) Cambridge, 1934. 2s. 6d.
- South Eastern Agricultural College, Wye.*—Dept of Economics, Report No. 19:—Investigation into Farming Costs of Production and Financial Results, XIV:—Milk Production: Five Years' Costs and Financial Results, 1928-29 to 1932-33, by J. Wyllie. (Pp. 97-136.) Wye, 1934. 2s.
- Gee, W.*—American Farm Policy. (ix + 146 pp.) New York: W. W. Norton & Co., 1934. \$1.50.

ADDITIONS TO THE LIBRARY

- Wallace, H. A.*—America must Choose. (World Affairs Pamphlets No. 3.) (33 pp.) New York: Foreign Policy Association; Boston: World Peace Foundation, 1934. 50 cents.
- Qureshi, A. I.*—The Farmer and His Debt. Being a Study of Farm Relief in Australia, New Zealand and South Africa, with Suggestions for India. (106 pp.) London: Indian Rural Reconstruction League, 1934. 2s. 6d.

Marketing

- Carret, J.*—Le marché du blé. La réglementation en France. (iv + 715 pp.) Besançon: Jacques & Demontrond, 1934. 75 fr.
- Hevesy, P. de.*—Le problème mondial du blé. (293 pp.) Paris: F. Alcan, 1934. 30 fr.
- Imperial Economic Committee.*—I.E.C./S./1:—Cattle and Beef Survey. A Summary of Production and Trade in British Empire and Foreign Countries. (367 pp.) London: H.M. Stationery Office, 1934. 5s.
- United States Department of Agriculture.*—Bureau of Agric. Econ. Service and Regulatory Announcements No. 144:—Official Grain Standards of the United States. (31 pp.) Washington, 1934.

Public Health

- Young, T. D.* (Edit.).—Text book of Meat Inspection (Ante-Mortem and Post-Mortem) including the Veterinary Control of Meat and Meat Products, by *R. V. Ostertag* (Translation by *C. F. Marshall*). (x + 744 pp. + 10 plates.) London: Baillière, Tindall & Cox, 1934. 45s.
- Orr, J. B.*—The National Food Supply and Its Influence on Public Health. (Chadwick Lecture, 1934.) (20 pp.) London: P. S. King & Son, 1934. 6d.
- Hinton, C. L.*—A Summary of Food Laws and Regulations together with the appropriate extracts from the Food Legislation of the United Kingdom and the Standards for Jam of the Food Manufacturers' Federation. Edited by *T. W. Jones*. (90 pp.) London: The Nema Press, 1934. 21s.

Water Supply, etc.

- University of Oxford, Institute for Research in Agricultural Engineering.*—Pumps for Farm Water Supply, by *C. A. Cameron Brown*. (42 pp. + 10 pl.) Oxford, 1934. 1s. 6d.
- British Electrical Development Association.*—What Electricity is Doing in the Country with special reference to Poultry Farming and Water Supply. A Paper read by *M. M. Harvey* at the Farmers' Electrical Conference held at the Royal Show, Ipswich, 1934. (8 p.) London: British Electrical Development Association, 1934.
- British Electrical Development Association.*—Water Supplies and Sewage Disposal in Rural and Small Urban Districts. A Report. (28 pp.) London: The British Electrical Development Association Inc., 1934.
- Ministry of Health.*—Reports on Public Health and Medical Subjects, No. 71:—The Bacteriological Examination of Water Supplies. (38 pp.) London: H.M. Stationery Office, 1934. 9d.
- Bedford Historical Record Society.*—Bygone Water Supplies. Survey of Ancient Buildings. Volume II. (36 pp. + 54 figs.) Published by the Society in Apsley Guise in conjunction with the Public Museum, Luton. 1933.

Field Crops

- California Agricultural Experiment Station.*—Bulletin No. 570:—Determining Tonnage of Hay in Stacks. (26 pp.) Berkeley, 1934.

ADDITIONS TO THE LIBRARY

- United States Department of Agriculture.*—Miscellaneous Publication No. 194:—A Pasture Handbook. (89 pp.) Washington, 1934.
- Imperial Economic Committee.*—28th Report:—Maize. (60 pp.) London: H.M. Stationery Office, 1934. 1s.
- Imperial Economic Committee.*—27th Report:—Grassland Seeds. (75 pp.) London: H.M. Stationery Office, 1934. 1s.
- Thomas, J. O.*—The Effect of Grazing with Dairy Cows upon the Botanical Composition of a Six-Year Old Pasture. (5 pp.) Dauntsey's School, Wilts., 1934.
- Arber, A.*—The Gramineae. A Study of Cereal, Bamboo, and Grass. (xvii + 480 pp.) Cambridge at the University Press, 1934. 30s.
- Scotland.*—The Report of the Committee on Scottish Barley for Use by Scottish Distilleries. (1934.) (20 pp.) Edinburgh and London: H.M. Stationery Office, 1934. 4d.
- Washington Agricultural Experiment Station.*—Bulletin No. 294:—A Comparison of Rotational and Continuous Grazing of Pastures in Western Washington. (36 pp.) Pullman, 1934.
- United States Department of Agriculture.*—Farmers' Bulletin No. 1732:—Growing Barley for Malt and Feed (14 pp.) Washington, 1934.
- Egypt, Ministry of Agriculture.*—Technical and Scientific Service (Botanical Section). Bulletin No. 127:—A Record of Wheat Breeding, 1921-1931. (127 pp. + 2 maps.) Cairo, 1933.

Horticulture

- Laurie, A., and Chadwick, L. C.*—Commercial Flower Forcing. The Fundamentals and Their Practical Application to the Culture of Greenhouse Crops. (x + 519 pp.) Philadelphia: Blakiston, 1934. \$4.00.
- Shewell-Cooper, W. E.*—Modern Flower Growing for Profit. (195 pp.) London: Ernest Benn, 1934. 5s.
- Gratiot, J.*—Les orchidées, leur culture. (170 pp.) Paris: Librairie Agricole de la Maison Rustique, 1934. 10 fr.
- Shoemaker, J. S.*—Small-Fruit Culture. A Text for Instruction and Reference Work and a Guide for Field Practice. (xv + 434 pp.) Philadelphia: Blakiston, 1934. \$3.50.
- Bewley, W. F., and Harnett, J.*—The Cultivation of Mushrooms. (63 pp. + 6 pl.) London: Shepherd & Hosking. 1934. 2s. 6d.
- United States Department of Agriculture.*—Miscellaneous Publication No. 169:—Descriptions of Types of Principal American Varieties of Cabbage. (22 pp. + 18 pl.) Washington, 1934.
- Edinburgh and East of Scotland College of Agriculture.*—The Cultivation of Vegetable Crops, by J. S. Chisholm. (16 pp.) Edinburgh, 1934.
- United States Department of Agriculture.*—Technical Bulletin No. 424:—Influence of Storage Temperatures on the Rest Period and Dormancy of Potatoes. (21 pp.) Washington, 1934.
- United States Department of Agriculture.*—Miscellaneous Publication No. 170:—Descriptions of Types of Principal American Varieties of Garden Peas. (39 pp. + 7 pl.) Washington, 1934.
- Minnesota Agricultural Experiment Station.*—Bulletin No. 298:—Mulch Paper in Vegetable Production. (20 pp.) St. Paul, 1933.

Pests, etc.

- New York State Agricultural Experiment Station.*—Technical Bulletin No. 221:—Studies on Barley Smuts and on Loose Smut of Wheat. (39 pp.) Geneva, N.Y., 1934.

ADDITIONS TO THE LIBRARY

- National Rose Society*.—The Enemies of the Rose. New Edition by F. V. Theobald and J. Ramsbottom. (165 pp. + xi pl.) London, n.d. 7s. 6d.
- Midland Agricultural College*.—Bulletin No. 30:—The Bird and Animal Pests recorded in the Midland Province, by A. Roebuck. (11 pp.) Sutton Bonington, 1934.
- Midland Agricultural College*.—Bulletin No. 32:—Insect and Allied Pests recorded in the Midland Province (Crop Pests and Insects, 1922 to 1934), by A. Roebuck. (33 pp.) Sutton Bonington, 1934.
- University of Oxford, Institute for Research in Agricultural Engineering*.—An Improved Method for the Handling and Dilution of Sulphuric Acid for Spraying Weeds, by R. K. Macdowall. (12 pp.) Oxford at the University Press, 1934. 1s.
- New York State Agricultural Experiment Station*.—Bulletin No. 643:—Dusting Miscellaneous Seeds with Red Copper Oxide to Combat Damping Off. (39 pp.) Geneva, 1934.
- New York Department of Agriculture and Markets*.—Circular No. 467:—Injurious Insect Pests and Fungous Diseases with Treatment and Spray Formulæ, including also Protection against Rodents. (90 pp.) Albany.
- Maine Agricultural Experiment Station*.—Bulletin No. 368:—Apple Spraying and Dusting Experiments, 1928 to 1932, in Relation to Scab, Yield, and Tree Growth. (415/501 + 4 pl.) Orono, 1933.

Poultry

- University of Bristol Department of Agriculture and Horticulture*.—Bulletin No. 12:—An Economic Survey of the Poultry Industry, by C. V. Dawe and J. D. Nutt. (91 pp.) Bristol, 1934.
- Kentucky Agricultural Experiment Station*.—Bulletin No. 337:—Cod Liver Oil for Laying Pullets. (22 pp.) Lexington, 1933.
- Kansas Agricultural Experiment Station*.—Technical Bulletin No. 37:—The Influence of Some Factors on the Hatchability of the Hen's Egg. (42 pp.) Topeka, 1934.
- Kansas Agricultural Experiment Station*.—Bulletin No. 268:—The Comparative Nutritive Value of Sorghum Grain, Corn, and Wheat as Poultry Feeds. (32 pp.) Manhattan, 1934.
- Blount, W. P.*—Poultry Ailments. (x + 306 pp.) London: Poultry World, 1934. 5s.

Dairying and Dairy Products

- University of Reading Agricultural Economics Dept.*—Financial Accounts Studies 5:—Financial Results of Dairy Farming in the Blackmore Vale, 1933-34, by E. Thomas and G. B. Bisset. (15 pp. mimeo.) Reading, 1934.
- Feltham, L. R. M.*—The Making of Ice Cream. (165 pp.) London: Heywood & Co., 1934. 6s.
- United States Department of Agriculture*.—Miscellaneous Publication No. 119:—The Manufacture of Low-Acid Rennet-Type Cottage Cheese. (11 pp.) Revised, Washington, 1934.
- Union of South Africa Department of Agriculture*.—Bulletin No. 135:—Some Important Aspects in the Manufacture and Marketing of Dairy Products. (23 pp.) Pretoria, 1934.
- University of Bristol, Department of Agriculture and Horticulture*.—Bulletin No. 11:—An Inquiry into Management for Milk Production, by C. V. Dawe. (59 pp. mimeo.) Bristol, 1934.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLI No. 12 March, 1935

NOTES FOR THE MONTH

The Eradication of Annual Weeds in Bulb Crops

THE following note has been communicated by Dr. G. H. Bates, Senior Agricultural Adviser under the Norfolk County Council:—

One of the difficulties encountered in the cultivation of bulbs on silt soils is the strong growth of annual weeds during winter and spring. The dense vegetation produced, especially by Chickweed (*Stellaria media*), tends to suppress the growth of the crop. It would also appear inevitable that the absence of light and of a free flow of air in between the bulb plants must stimulate the spread of disease. The exclusion of light will also cause the plants to grow too long in the stalk. If weeds persist when the flowers are harvested, gathering is greatly impeded and conditions are wet owing to the retention of dew or rain by the weeds. In addition, the land may become heavily infested with weed seeds.

With bulbs, surface cultivation in autumn and winter is out of the question, even in the form of a light hand hoeing. One reason for this is that the land is usually too wet for the work, and a second that the bulbs would easily become dislodged or damaged. Inter-row cultivation is also impossible as the bulbs are below ground until towards spring and the lines of plants cannot be distinguished. In view of these facts, spraying is a very rational procedure for the eradication of annual weeds in bulb fields from late summer until the winter months.

To test the effect of spraying with dilute sulphuric acid, a trial was conducted by Mr. E. Cave, Terrington St. Clement, near King's Lynn, in November, 1933, on a crop of tulips. A few of the bulbs were emerging from the

NOTES FOR THE MONTH

ground, but most of them were still below the surface. Strips of the crop were sprayed with a 10 per cent. solution of sulphuric acid (B.O.V.) at the rate of 80 gallons per acre. The remainder of the crop was left unsprayed.

The treatment resulted in a complete control of weeds upon the sprayed strips. The soil remained free from weed vegetation throughout the season. On the other hand, the untreated parts of the crop became choked with weeds, of which Chickweed was the most prevalent. Sow Thistle (*Sonchus oleraceus*) and Groundsel (*Senecio vulgaris*) were also fairly abundant.

The tulips suffered no damage. It is not claimed that a sulphuric acid spray would be non-injurious to the crop if applied after the crop was above ground, but the matter is under experiment.

The trial was repeated in November, 1934, when a difficulty occurred that had not arisen before. Owing to the wet autumn the weeds were constantly moist with rain or dew. The 10 per cent. solution had no effect at any time of the day, and a 20 per cent. solution was not completely effective, though it did check the growth of weeds. This trouble arises with the use of sulphuric acid spray in other crops, but these are sprayed at a season when moist dull conditions do not continue for long periods. The success of the treatment appears, therefore, to be dependent upon the weather prevailing at the time.

The Official Seed Testing Station in 1933-34

A REPORT* for the year 1933-34 shows that in the twelve months ended July 31, 1934, the Official Seed Testing Station tested 29,487 samples of seeds, the number of samples received from outside sources being 27,077. These figures are rather lower than those of the previous year, which were swollen by the increased interest in wheat in the early days of the quota. The large number (2,410) of investigational samples bears witness to the research activities of the Station.

A special example of the service provided by the Station arises in connexion with the testing of the germination of malting barley. At a Conference of Malting Barley Growers and Maltsters, held at Rothamsted in October, 1934, the

* The Report of the National Institute of Agricultural Botany, Cambridge, 1933-34.

Notes for the Month

point was made that maltsters would not accept the Official Seed Testing Station barley germination figures as proof of suitability for malting, as these did not indicate the germinating capacity within the first three or four days. In the usual way this is so, but whenever asked to do so, the Station is prepared to supply information as to the germination that takes place within any stated number of days.

The Station has again co-operated with the New Zealand Seed Testing Station, Palmerston North, with respect to the deterioration of parcels of Chewings Fescue shipped to this country. The results obtained have been published in an article by Mr. N. R. Foy of the New Zealand Station in the July number of the *New Zealand Journal of Agriculture*.

A large amount of investigational work has been carried out, both in the greenhouse and in the open, on the effect of dressing peas with mercurial dusts. This work is now being extended to a field scale. In conjunction with the Agricultural Seed Trade Association, field trials were also carried out in 1934 in the hope of throwing further light on the condition known as "Marsh Spot" in peas.

The Wild White Clover Growing-on Committee met on July 31, 1934, and examined the plots sown in 1933 together with those held over from the previous year for re-examination. The number of plots passed up to July 31 was 616 and the number sown 872.

The Chief Officer attended the International Seed Testing Congress held at Stockholm at the beginning of July, and was re-elected to the Executive Committee.

No seed testing course was held in 1934, nor was there a seed analysts' conference, but the usual reference samples of different types of seed were prepared by the Station and were distributed by the Ministry of Agriculture to the licensed stations.

Wild White Clover Certification Scheme

THE increase in the number of applications for the inspection of wild white clover pastures and for certificates in connexion with the sale of wild white clover seed during last year indicates the continued interest taken in the certification scheme.

Unfortunately, the wild white clover harvest of 1934 was very light as compared with 1933, and there has, consequently, been a noticeable falling off in the number of

NOTES FOR THE MONTH

applications for certificates so far received this season. As already indicated, this does not denote any lessened interest in the scheme, but merely reflects the reduced amount of seed available.

There is evidence that seed saved from approved pastures is sometimes disposed of without a certificate being obtained. It would obviously appear of advantage to both growers and merchants to make use of the scheme in its entirety, because it does not always follow that when a field has been inspected it has also been approved, and only by obtaining a certificate for the seed can all parties be adequately safeguarded. It is of particular importance to all growers that seed that conforms to the standards set up by the scheme shall be used in preference to seed produced from pastures that are not included in, or are not eligible for, the scheme.

Growers of wild white clover seed who have not yet registered their pastures are reminded that applications for inspection must be in the hands of the County Committee of the National Farmers' Union by April 15.

Inspection and registration of a pasture can be undertaken in any season, and it is advisable to make application in the matter before the year in which it is proposed to take a seed crop. A "growing-on" test is conducted in each instance so that a field is not finally approved until about 16 months after inspection. Applications regarding fields that are eligible for registration under this scheme should, therefore, be submitted as early as possible, so as to avoid the production of a crop of seed which cannot be certified at the time it is offered for sale.

Full particulars of the scheme may be obtained from the Secretary of each County Branch of the National Farmers' Union, but it should be understood that non-members as well as members of the Union are eligible to participate in the scheme.

Potato Synonyms

THE following note has been communicated by the Director of the National Institute of Agricultural Botany:—

The Potato Synonym Committee, which was appointed by the National Institute of Agricultural Botany in 1920, has since that year repeatedly examined and reported on the identity of all the standard varieties now on the market as well as many thousand new seedlings. In 1934, besides

NOTES FOR THE MONTH

examining as usual the new seedlings entered for the wart disease immunity trials at Ormskirk, the Committee has examined plots planted with tubers offered for sale to the public in the spring of 1934 under what have previously been found to be synonymous names. The findings of the Committee on these plots were:—

E. Webb & Sons (Stourbridge) Ltd.'s	Renown	is a synonym of Abundance.	
Stuart & Mein's	English Beauty	„	„ British Queen.
Carter's Tested Seeds Ltd.'s	Royalty		British Queen.
D. & W. Croll Ltd.'s	Cherub		Duke of York.
McHattie & Co.'s	Chester Early		Duke of York.
Baker's	Queen of the Earlies		Duke of York.
Tillie, Whyte & Benvie's	Victory	„	„ Duke of York.
Carter's Tested Seeds Ltd.'s	Advancer	„	„ Eclipse.
E. Webb & Sons (Stourbridge) Ltd.'s	Colonist	„	„ Eclipse.
J. E. Knight & Son's	Dreadnought	„	„ Great Scot.
C. M. Haigh's	Mons Star	„	„ King Edward.
S. Finney & Co. Ltd.'s	Cleadon Park	„	„ King Edward VII—Red Type.
J. E. Knight & Son's	Earliest of All	„	„ Sharpe's Express.
S. Finney & Co. Ltd.'s	Early Favourite	„	„ Sharpe's Express.
E. Webb & Sons (Stourbridge) Ltd.'s	Express	„	„ Sharpe's Express.
Carter's Tested Seeds Ltd.'s	First Crop	„	„ Sharpe's Victor.
Stuart & Mein's	Mein's Chieftain	„	„ The Towse (Climax).
Carter's Tested Seeds Ltd.'s	Longkeeper	„	„ Up-to-Date.
E. Webb & Sons (Stourbridge) Ltd.'s	Prosperity	„	„ Up-to-Date.
McHattie & Co.'s	Scottish Triumph	„	„ Up-to-Date.
Daniel Bros.'	Sensation	„	„ Up-to-Date.
Carter's Tested Seeds Ltd.'s	The Factor	„ /	„ Up-to-Date.
Toogood & Sons Ltd.'s	Tremendous	„	„ Up-to-Date.

Cereal Synonyms

THE following note has been communicated by the Director of the National Institute of Agricultural Botany:—

The Cereal Synonym Committee, which is appointed by the Royal Agricultural Society of England, the National Farmers' Union, the Agricultural Seed Trade Association, the National Association of Corn and Agricultural Merchants, the Cambridge University Plant Breeding Institute,

NOTES FOR THE MEETING

and the National Institute of Agricultural Botany, has come to the following decisions on the stocks of cereals which they examined in 1934. This statement is issued by the National Institute of Agricultural Botany in compliance with the request of the Committee that as much publicity as possible should be given to their decisions.

In arriving at their decisions the Committee were guided by the following definition of a cereal synonym:—

"The Cereal Synonym Committee regard two cereals as synonymous when they present precisely similar morphological characters, and when they also possess identical physiological characters in so far as they can be determined. Even then by this term they do not necessarily imply that these two varieties are of identical origin, though doubtless in the majority of cases they are. The possibility of two cereals of different parentage presenting such a close, if not complete, similarity as to mask their individuality has not been lost sight of. But the Committee have to deal with facts as they are; they, therefore, regard as synonymous all cereals which are identical in the sense used above even when they know that the origins are different.

Note.—Before the Committee come to a conclusion concerning the synonymy of any variety the breeder and/or the introducer is given an opportunity of demonstrating to the Committee such differences as he may claim to exist between his variety and the type variety."

Using the term "synonym" in the above sense the Committee are of the opinion that the names listed below in the left-hand column are synonyms of those in the right-hand column.

WHEAT

James Carter & Co.'s	Corn in Egypt is a synonym of Setter.
----------------------	---------------------------------------

OATS

James Carter & Co.'s	Quite Content is a synonym of Victory.
" " "	Harvester 1926 " " " Superb.
Edward Webb & Sons	White Horse " " " Victory.
(Stourbridge) Ltd.'s	
" " "	Ascot, 1933 stock* " " Record.
" " "	Ascot, 1934 stock " " Victory.

* Stock mixed but predominantly Record.

The Committee understand that Harvester 1926 will not be offered for sale in the future.

In response to inquiries from farmers and seedsmen, the Committee gave careful attention to the question of Victor and Wilhelmina. They examined two stocks of Victor and two of Wilhelmina and considered evidence concerning Wilhelmina from Dutch authorities. They came to the following conclusions:—

Wilhelmina consists of a number of strains. These strains are very similar and are only separated satisfactorily by

Notes from the North

means of the phenol reaction. The predominant strains grown in Holland give a dark brown coloration, either uniform or more or less spotted. Only 1 per cent. of Dutch samples have as little as 10 per cent. of grains giving a brown coloration.

The two stocks of Victor were alike and could be distinguished from Wilhelmina by means of the phenol reaction. They gave a predominantly pale colour with phenol. Only a few grains gave a dark reaction.

In view of the morphological similarity of these wheats there is little doubt that they are easily confused in commerce, but they cannot be regarded as identical, or therefore as synonyms.

Many of the names reported by the Committee in previous years as synonyms have now been abandoned. The names given below, however, were still in use in 1934; the distinct varieties of which they were found to be synonyms when examined by the Committee are given in each case.

WHEAT

James Carter & Co.'s	Red Standup was a synonym of Square-head's Master.
Toogood & Sons'	Squarehead's Success " " "
Edward Webb & Sons	Standard Red " " "
(Stourbridge) Ltd.'s	
A. G. Leighton" Ltd.'s	Standup White " Wilhelmina.
	Twenty-One " Weibull's
	Standard.
James Carter & Co.'s	Yeoman King " Yeoman.
" " "	Red Admiral " Japhet or Red Marvel.

OATS

Herbert Parker Ltd.'s	Norfolk Emperor was a synonym of Abundance.
" " "	Norfolk Wonder " " " "
" " "	Norfolk Yielder " " " "
Edward Webb & Sons	Newmarket " " " "
(Stourbridge) Ltd.'s	
Herbert Parker Ltd.'s	Profusion " " " Marvellous.
" " "	Profusion Winter Oat was a synonym of Marvellous.
Edward Webb & Sons	White Winter was a synonym of Marvellous.
(Stourbridge) Ltd.'s	
James Carter & Co.'s	Giant Black Cluster was predominantly Bountiful with some Black Winter.
" " "	Giant Black Winter was predominantly Black Winter with some Bountiful.

Note.—Though the spring stock of Parker's Profusion examined was a synonym of Marvellous, evidence was laid before the Committee that Profusion had previously been a synonym of Superb.

BARLEY

Herbert Parker Ltd.'s	Fortyfold was a synonym of Spratt-Archer.
-----------------------	---

NOTES FOR THE MONTH

Sampling Observations on Wheat 1934-35: Report for First Quarter

DURING the present season observations on the growth of the wheat crop are being taken at the ten stations that took part in the scheme last year. The table below gives a summary of the observations for the first quarter, the stations being arranged in order of sowing date. This varied from October 9 at Long Sutton to November 14 at Boghall.

The most marked feature of the quarter has been the rapid germination at all stations. The longest interval between sowing date and date of appearance above ground this year was 22 days, as against 37 days in each of the preceding two years, and the average length of interval was 17 days, compared with 24 days in 1933 and 23 days in 1932. The weather between sowing date and appearance was generally mild, and comparison of the soil temperature during the intervals at the same stations in 1933 and 1934 confirms the conclusion drawn in the previous two years that the length of interval depends very largely on the temperature. At Rothamsted, for instance, the only station at which the interval was appreciably longer in 1934 than in 1933, the mean soil temperature at a depth of 4 inches during the interval was 40° F. in 1934, as against 44° F. in 1933.

The shortest interval, 10 days, was observed at the two stations, Long Sutton and Seale-Hayne, where sowing took place in the first half of October, but for the other stations the increase in length of interval with the later date of sowing, noticed in previous years, was not apparent, there being little difference between the intervals. This may possibly be due to the cold weather in the first week of November. As in the two previous years Yeoman has again appeared significantly earlier than Squarehead's Master, this time at all nine stations at which the date of appearance was observed. In fact, owing to its rapid appearance, only four stations managed to observe the date for Yeoman with precision. The local varieties, grown at four stations, were significantly later than the two standard varieties, except at Woburn; last year on the other hand, they were significantly earlier.

The first observations on plant number, shown in the last columns of the table, are taken about three weeks after the date of appearance. Yeoman has given a higher plant

NOTES FOR THE MONTH
SAMPLING OBSERVATIONS ON WHEAT, 1934-35
FIRST QUARTER.

Station	Variety	Sowing date	Appearance above ground		Plant density per 32 metres drill	
			Date	Standard error of difference	First count	Date
LONG SUTTON Hampshire	Squarehead's Master	Oct. 9	Oct. 19.53	±0'125†	2046	Oct. 30
	Yeoman		before Oct. 19		2366	
	Wilhelmina		Oct. 19.91		2045	
SEALE-HAYNE Devonshire	Squarehead's Master	Oct. 9	Oct. 19.12	±0'188‡	1902	Nov. 6
	Yeoman		before Oct. 18		1930	
	Garton's No. 60		Oct. 20.44		1911	
WYE Kent	Squarehead's Master	Oct. 23	Nov. 10.00	±0'125	2099§	Dec. 1
	Yeoman		Nov. 9.62		2468§	
ROTHAMSTED Hertfordshire	Squarehead's Master	Oct. 26	Nov. 17.34	±0'100	2264	Dec. 10
	Yeoman		Nov. 16.06		2640	
	Victor		Nov. 17.69		2271	
PLUMPTON Sussex	Squarehead's Master	Oct. 30	Nov. 20.50	—	1161	Jan. 24
	Yeoman		before Nov. 19		1608	
CIRENCESTER Gloucestershire	Squarehead's Master	Nov. 2	—*	—	1011||	Dec. 17
	Yeoman		—*		1351	
NEWPORT Shropshire	Squarehead's Master	Nov. 5	about Nov. 26¶	—	1086	Dec. 18
	Yeoman				1329	
WOBBURN Bedfordshire	Squarehead's Master	Nov. 8	Nov. 29.19	±0'104	1167	Dec. 22
	Yeoman		Nov. 28.38		1363	
	Victor		Nov. 28.88		1514	
SPROWSTON Norfolk	Squarehead's Master	Nov. 9	about Nov. 26¶	—	1571	Dec. 18
	Yeoman				1983	
BOGHALL Edinburgh	Squarehead's Master	Nov. 14	Dec. 3.69	±0'116	2341	Dec. 24
	Yeoman		Dec. 3.19		2171	

* Appearance above ground not observed.

† Applicable to S.H.M. and Wilhelmina only.

‡ Applicable to S.H.M. and Garton's No. 60 only.

§ Based on 32 three-quarter-metre samples.

|| Based on 40 one-metre samples.

¶ Squarehead's Master significantly later than Yeoman.

NOTES FOR THE MONTH

number than Squarehead's Master at all stations except Boghall. This agrees with the results found in 1932, but last year Yeoman was higher in only four out of eight stations. The plant numbers as a whole were considerably above those in either of the preceding two years. The standard rate of sowing the seed is $2\frac{1}{2}$ bushels per acre and gives about 2,500 seeds to the 32 metres for Yeoman and 2,200 for Squarehead's Master. The plant number at Rothamsted for Yeoman, it will be noticed, exceeds 2,500, but here the seed was sown at the rate of 3 bushels per acre.

"The Control of Flea Beetles in Seed-beds": Correction

THE authors of the above article, published in the last (February) issue of this JOURNAL (page 1070) have notified the Ministry of an error appearing in the bottom paragraph on page 1071. The second sentence of this paragraph should be amended to read as follows:—"Eggs are laid on the ground near the plants, and, with the exception of the Large Striped Flea Beetle (*P. nemorum*), the larvæ feed on the roots of the plants; the larvæ of *P. nemorum* crawl up and mine into the leaves."

Extinguishment of Manorial Incidents

THE Law of Property Act, 1922, decreed a 10-years' period for the extinguishment of manorial incidents by compensation agreement. As this period will expire on December 31, 1935, the Ministry has issued the following memorandum* to make the position clear:—

For the Information of Lords and Stewards of Manors and of Owners of Land subject to Manorial Incidents.

Copyhold land, that is to say, land forming part of a manor and held by a tenant by copy of Court Roll subject to certain rights and services (generally known as "manorial incidents") due to the lord of the manor, was on January 1, 1926, converted into freehold land by the operation of the Law of Property Act, 1922, the tenant becoming the freeholder. Certain of the "manorial incidents" referred to, such as quit rents, fines on a change in ownership of the land, and the rights of the lord to timber on the land were continued in force for a further period of 10 years unless extinguished in individual cases in the meantime.

Copies of this memorandum will be supplied on application to the Secretary, Ministry of Agriculture and Fisheries, 7, Old Bailey, London, E.C.4.

NOTES FOR THE MONTH

In certain manors, manorial incidents of a similar nature issue out of lands held as freehold prior to January 1, 1926. The statutory provisions relating to the extinguishment of incidents issuing out of land enfranchised by the Law of Property Act, 1922, apply also to these manorial incidents "of a like nature."

Extinguishment of manorial incidents can be effected at the present time either:—

(1) By an agreement made between the lord of the manor and the tenant, or

(2) Compulsorily through the Ministry on the initiative of either the lord or the tenant. The amount to be paid by the tenant as compensation in such cases is governed by the Act. The party initiating the proceedings has to pay the costs in all normal cases.

On January 1, 1936, unless these "manorial incidents" have been extinguished in one of the above ways, they will be extinguished automatically under the Act, subject to the payment of compensation by the tenant.

The Act lays down the procedure to be carried out for fixing the amount of compensation after January 1, 1936, and this procedure necessitates the employment of a valuer whose fees will normally have to be paid by the tenant. The Act also requires that all the other costs and expenses of the proceedings shall be borne by the tenant except in special cases where they may be apportioned. Where manorial incidents are extinguished within the 10 years before 1936, the agreement, award or certificate under the Act is not chargeable with stamp duty and no fees or expenses are charged by the Ministry. These exemptions will not, however, operate after December 31, 1935, and it follows that the costs and expenses will then be increased.

There are many cases in which the actual value of the incidents to be extinguished is comparatively small, cases, for instance, where the only incident affecting the tenant's land is a small quit rent of say 1s. or 2s. per annum, or perhaps a fine payable on a change in ownership of the property amounting to a few shillings only. In such cases the costs of formal compensation proceedings under the Act after 1936 are likely to amount to much more than the compensation money. As in all normal cases these costs will have to be paid by the tenant, and as, on the other hand, the lord of the manor cannot be reasonably expected to forego the compensation to which the Act entitles him, it

NOTES FOR THE MONTH

will be seen that it is possible in many cases for both the lord and the tenant to benefit by settling the matter by an agreement between themselves before the end of 1935, as the making of such an agreement avoids incurring some of the expenses, such as valuer's fees, stamp duties, and Ministry's fees which will necessarily add to the cost, after that date.

The following cases will serve as an illustration :—

Incidents to be Extinguished.	Approximate minimum cost if dealt with now by Agreement.			Probable additional cost if dealt with under the Act after Dec. 31, 1935.
A. Quit rent of 10s. per annum.	Compensation money ...	£	s. d.	Between £3 and £5.
	Solicitors' costs, say	10	0 0	
	Total ...	5	10 0	
B.(1) Fine certain valued at say 5s. payable on death or alienation. Tenant's age, 38. Annual Value, £20.	Compensation money ...	15	10 0	Between £5 and £7.
(2) Free Rent of 5s.	Solicitors' fees	9	5 0	
(3) Forfeitures.	Steward's compensation	5	10 0	
	Total ...	4	10 0	
		19	5 0	

The figures quoted in these cases are given merely as illustrations and should not be taken as representing the exact costs in similar cases. It will be seen, however, that in each instance there is a margin of increased cost after December 31, 1935, sufficient to allow of the parties arriving at a *voluntary* agreement for extinguishment which will benefit both parties.

The scale of compensation provided by the Act is republished in the Manorial Incidents (Extinguishment) Rules, 1925, copies of which may be purchased from H.M. Stationery Office, price 7d. (exclusive of postage). This scale may serve as a guide in considering any proposed terms of agreement.

The Ministry therefore suggests that both lords and tenants should, in their own interests, give consideration in the near future to the question of extinguishing the outstanding manorial incidents by agreement. Such agreements may generally be made and carried out without reference to the Ministry.

NOTES FOR THE MONTH

Garlic in Wheat

MANY farmers have found the Crow Garlic or Wild Onion (*Allium vineale*) to be one of the most troublesome weeds of both arable and grass land. This weed gives them a very difficult and costly time when they endeavour to eradicate it, for it is not amenable to any ordinary measures. Not only is the weed troublesome in that way, but it may taint the milk of cows or the meat of fatting beasts and sheep that may feed upon it. This necessitates the removal of the stock from infested pastures for a week or two before they go to the butcher.

Another point about Crow Garlic is the fact that it is propagated by bulbils as well as bulbs—seeds are rarely found in this country. The bulbils resemble miniature bulbs about the size of wheat grains and are produced on the flower heads. Apart from forming new plants they may be particularly injurious because the weed is apt to occur in wheat and the bulbils to be included in the threshed grain, from which they are only removed with some difficulty. In addition, if bulbils are ground up with wheat in the process of milling the flour is tainted and rendered unfit for bread-making—or even for milch cows or fatting stock. This difficulty greatly reduces the value of the infested wheat, which is often accordingly sold for poultry—with the consequent danger of distributing the weed to other areas, and causing new centres of infestation.

A full account of the Wild Onion, as well as other arable land weeds, is given in the Ministry's Miscellaneous Publication No. 61 (*Weeds of Arable Land*), obtainable from H.M. Stationery Office (Paper covers, 2s. 6d.; Quarter bound, 3s.; Cloth covers, 3s. 6d. net).

Britain's Food Imports

A STATISTICAL Study* that has recently been published by the Agricultural Economics Research Institute, Oxford, shows that, between 1927-29 and 1931, imports of food into the United Kingdom increased by about 17 per cent. Imports from Empire and foreign countries showed approximately the same rates of expansion. The largest increases occurred in imports of vegetables, dairy produce and fruit,

* *The Planning of Britain's Food Imports: A Quantitative Study of the effects of Recent Legislation.* By K. A. H. Murray and Ruth L. Cohen. Agricultural Economics Research Institute, Oxford. 106 pp. 3s. 6d.

NOTES FOR THE MONTH

which rose by 56 per cent., 23 per cent. and 20 per cent. respectively; meat imports increased by 17 per cent., wheat and flour by 10 per cent. and eggs by 4 per cent. The peak was reached in October, 1931, when the imports were 35 per cent. above the average of the corresponding months of 1927-29. There followed a steady decline, which was reflected in all groups except dairy produce, although total supplies in 1933 were still above the 1927-29 level. This decline was due entirely to a reduction in supplies from foreign countries, which fell by 25 per cent., whereas imports from Empire countries showed an increase of 21 per cent. As a consequence, the share of the Empire in the United Kingdom imports increased from 38 per cent. in 1931 to 50 per cent. in 1933. From this and other indications given in the Study, it is concluded that, in so far as the aim of the Government's policy has been to reduce total imports and to give the Empire an expanding share, it has been successful.

Agricultural Machinery Testing Committee

THE undermentioned Certificate and Report, issued by the Ministry, have been published in pamphlet form (price 2d., post free 2½d.):—

No. 51. The Lincoln Pig-weighing Machine, submitted for test by the inventors, Messrs. Montgomery & Lecoche, Richmond Road, Lincoln.

The test was carried out by the Institute for Research in Agricultural Engineering, University of Oxford.

Copies of the pamphlet may be obtained, at the prices stated, through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

MANAGEMENT AND MECHANIZATION IN FARMING

The late G. H. NEVILLE, J.P.

AGRICULTURE is not only the oldest of human industries but it still remains the way of life that utilizes the most diverse aspects of scientific knowledge. A course of two or three years' training in an Agricultural College can do no more than indicate to the student what there is to be known about farming. Husbandry, horticulture, chemical and veterinary science, botany, accountancy, and innumerable 'ologies each offers a lifetime's study as a specialist when the student has discovered his real bent; and how, in this age of mechanical power, engineering has become a special branch that cannot be neglected by a farm manager.

A farm manager may have a reasonably straightforward job when he is called upon to take over a fertile farm known to produce certain crops on a profitable basis; but the farm managerial problems present themselves as a body when it is proposed to cultivate a holding that has gone practically derelict. In recent years such conditions have, unfortunately, become increasingly frequent in our arable areas, owing to the loss of capital by the tenant-farmer class, and landlords and mortgagees consequently find themselves with unlettable farms on their hands and no expert knowledge as to how they may best recondition them or maintain them in a rent-paying condition.

In these circumstances mechanization frequently presents the line of least resistance, owing to the relatively small capital required, and a farmer or contractor with the requisite knowledge finds himself in the position of a farm salvage corps.

The first duty for a manager undertaking the cultivation of such land is to make a preliminary survey. On what lines has the farm been previously carried on, and what were the principal causes of failure under these conditions? Given proper cultivation, is there a prospect of success with some specialized crop—e.g., malting barley, potatoes, carrots or sugar-beet, and are markets available? What

MANAGEMENT AND MECHANIZATION IN FARMING

is the proportion of arable to grass? Can the grass land be best turned to account with sheep, fattening cattle, store cattle or dairying? What are the limiting factors to crop production on the land? Is the soil acid from lack of lime? Does the area suffer from excess of moisture and require drainage, or from lack of moisture owing to a gravel subsoil? Is it in reasonably fertile condition, or thoroughly worked out and full of weeds? Can mechanization bring to bear new forces—such as deep ploughing, the gyrotiller, or the mole-draining plough—that can obviate previous failures? Until these and similar points have been studied thoroughly the manager is in no position to advise as to the most profitable use to which the farm may be put, or to formulate a course of cropping.

Market conditions must first be considered in planning the rotations and cropping, and it is unfortunately true that of the ordinary farm crops wheat and sugar-beet are the only two with a definite price level on which reasonable estimates can be based. Of these sugar-beet is restricted to areas within reach of a factory, and soils of sufficient depth to allow of proper root development. Of the cereals, wheat must be the stand-by of the farmer who is contemplating mechanization. Barley can only be grown profitably on soils suitable for the production of malting samples, and unfortunately the present cereal year has shown that even with the area restricted to 860,000 acres the supply is in excess of the demand, which does not now reach half its pre-war volume.

Oats are chiefly grown as a cattle food, and as cattle do not figure largely in mechanized farming, the area should be restricted to home requirements.

Where local conditions indicate that it will be wise to abandon the traditional four-course rotation, mechanization is indicated. The object here is to replace horses by tractors as the source of power, to substitute the artificial-manures distributor and ploughed-in green crops for the dung cart as a source of fertility, and to concentrate the cleaning effects of the fallow year and the renovating effects of the seed leys into a single season. This permits of two white-straw crops in succession followed by a fallow year. We thus have 66 per cent. instead of 50 per cent. of the area in cash-paying crops. It is very desirable to make the third year or fallow area at least pay for rent and over-

MANAGEMENT AND MECHANIZATION IN FARMING

head charges, where this is possible, but it is not on every farm that a fallow cash crop is available. Sugar-beet can be grown within reach of a factory if crops of eight tons per acre or more can be expected in average years. Liberal manuring with artificials leaves the land in good heart, and a great part of the crop can be cleared in time to permit of sowing a wheat crop. It is, however, essential that the extra labour for this crop is provided by a special gang.

On light, deep soils potatoes form one of the best cleaning crops for reclaiming derelict land. The turnover they should produce should pay for deep cultivation and liberal manuring, and a heavy growth of tops smothers weeds. They have the added advantage that they can be grown on acid soils that will not produce sugar-beet. Unfortunately market requirements are already satisfied by the present area devoted to potatoes.

Of the leguminous group of plants, peas in some areas, whether for pulling green or harvesting as a food crop, may meet with a limited sale. On heavy land beans may also produce a cash crop. Both these crops, however, have to be harvested, and if plans have been made for using a combine harvester to its fullest extent on cereal cropping it may be that they cannot be worked into the rotation.

In the absence of cash crops the next best outlet for crops of the fallow rotation appears to be for use with live stock, if such are kept to utilize the grass land. Marrow stem kale and mangolds are capable of producing a large tonnage per acre and are useful to both shepherd and herdsman.

A crop that seems to offer possibilities either for ploughing-in green or fattening sheep is a mixture of rape and peas. Sown in May or early June after the land has been cleaned, a mixture of about 4 lb. of rape and 1 cwt. of peas produces a thick and quick-growing smother crop to keep down weeds, and lambs can be turned in as soon as the pea pods are half filled.

If cash crops are not available and live stock are not kept, recourse must be had to ploughing-in green crops to maintain the fertility of the land. This appears to be a somewhat controversial subject, as the Woburn experiments do not show any appreciable benefit from ploughing in mustard or tares. On the other hand, practical farmers in many parts of the world have the highest opinion of the

Management and Mechanization in Farming

efficacy of this method, though they cannot produce definite figures of comparative tests.

The writer has been told "It is no use ploughing in beans as a preparation for wheat, as all your crops will go down," and also "If you plough in a good crop of beans you will *make* the land for five years." In Germany lupins ploughed-in on sandy wastes have been found the most effective means of reclaiming them, and Mr. Oldershaw and his neighbours at Tunstall have been able to produce 4 and 5 qr. of wheat on the most unpromising of acid sands after chalking and ploughing-in lupins.

Red clover ploughed-in is considered one of the best preparations for heavy crops of potatoes on our rich fens, and the clover crop has always been the renovating agent in the four-course system.

Where stock are kept, two- or three-year leys based on wild white clover, to be followed by several years of white-straw crops, may form part of the system.

Good farm management in all cases implies the judicious provision of spare parts and reserves for all equipment, whether human or material, and this is particularly necessary with mechanized farms. In these the working units are cut down to their minimum, and the breakdown of a tractor for a week, or an attack of influenza in its driver, will cause infinitely more dislocation in our planned production than the lameness of a horse or two or the illness of a ploughman. For this reason, in equipping a mechanized farm reasonably small units appear more appropriate than larger units. In planning the equipment of a mechanized farm consideration must be given to the proportion of grass that has to be farmed, and to the cropping proposed for the fallow areas. There are few farms in the country where an area of arable land can be farmed without some accompanying grass. Sometimes it is possible to let off the grass land to neighbouring farmers, and where there are no live stock it may be economic to rely on mechanical traction only. Where live stock are kept a blend of horses and tractors is often preferable.

A waggoner on large farms usually has charge of four horses, and this team will suffice for the cultivation of a farm with 100 acres of arable. When the arable area rises to 200 acres, of which say 140 are to be corn, the area is hardly large enough to justify a combine harvester, and

MANAGEMENT AND MECHANIZATION IN FARMING

the horse team would be required to do the leading at harvest, but then in lieu of two further pairs of horses one of the smaller three-furrow tractors would be an economic investment. With up to 400 acres of arable it would still be possible to work medium land with a three-furrow tractor and four horses, particularly if low rubber-tyred carts are provided for the harvest work. At over 400 acres of arable we enter the areas where combine harvesters may be profitably employed and more complete mechanization is possible. If one of the smaller combines with an 8-ft. cut is contemplated it is necessary to have one of the larger four-furrow tractors to handle it, and on over 400 acres of arable this larger size tractor is well justified. At 600 acres we reach the unit capable of employing a large size (10-ft. cut) combine to its full capacity. This area can be worked by a single large tractor and four horses, but not with safety, and the provision of a 10-h.p. tractor on rubber tyres in addition is well justified as an insurance.

It will be noted that the waggoner's four-horse team is still retained. In the writer's opinion, where live stock are kept on the grass land, and the fallow area is cropped with either fodder crops or sale crops, such as potatoes or beet, the use of horses is economically justified. It is quite possible to cultivate such an area as 500-600 acres with a four-furrow tractor and an auxiliary light tractor providing the cropping is adjusted, and with bare fallows substituted for cropped fallows or renovating crops, substantially larger areas can be handled. It is the flexibility of power farming that is one of its chief advantages, but as mentioned above it is essential that provision be made for mechanical breakdown.

There is much light work such as drilling, seed harrowing, rolling and manure distributing that can be quite economically carried out with horses when the tractor is ploughing, disc harrowing, or otherwise preparing the seed bed, and where live stock are kept, carting in some form is always required.

It is suggested above that farms of up to 400 acres of arable can be managed with a single tractor and four horses. Tractors are employed on many smaller farms managed on traditional lines but it is noticeable that in too many instances the tractor is used only as an auxiliary to the

MANAGEMENT AND MECHANIZATION IN FARMING

horses, which are retained in their traditional number, and little or no attempt is made to adapt the management of the farm to the new power so that neither horses nor tractor are economically employed. With the horses go the men to work them, so here again is waste.

Taking 600 acres of arable with say 200 acres of grass as a reasonable power-farming unit, good cultivation can be maintained with a staff of about five men. Of these, two should be capable of driving a tractor, one a waggoner, one a shepherd to look after the live stock, and one a spare hand, preferably a hedging and ditching expert. The farmer himself should be capable of replacing any of the other men in an emergency. Extra casual labour will be required in busy times.

It is noticeable that the permanent labour staff does not increase proportionately to the size of the farm. It would be difficult to run 300 acres of mixed crops and live stock with less than three men, whereas if a further 600 acres were added to the above-mentioned 800-acre farm one more tractor driver and another spare hand, making seven in all for 1,400 acres, would cope with the work.

Mechanized corn-growing can be looked on as the mere foundation of the arable farm system. Given that the land must be cultivated, wheat is the only crop the price level of which at present promises remunerative returns from average crops. Labour can be specially engaged for other branches where and when these are likely to be definitely profitable. Sugar-beet is an instance in point. A pig man, cattle man, or poultry man can be added to the staff if the produce of his labour can pay his wages and the interest on the extra capital employed.

Mechanized farms are fortunate in this respect, that with the small staff necessary a large choice of candidates is available, and a particularly good staff of young and keen workers can be selected. There has probably never been a time when so many people have been thinking out economies or improvements in farming practice. Divergence from traditional methods has hitherto been discouraged. Now that radical changes are seen to have their advantages in certain cases, any man on the farm is likely to come forward with a useful suggestion.

In planning the rotation an important point of good management is so to arrange that the tractor work is evenly

MANAGEMENT AND MECHANIZATION IN FARMING

distributed throughout the year. Bare fallows, followed by winter wheat, followed by spring wheat or barley, is the natural cropping, as the bare fallows are ready for sowing with wheat as soon as harvest is over, and there is then time to prepare the wheat stubbles for the spring corn. It is when fallows are cropped that congestion may arise at certain times. Similarly it is advantageous to plan a succession of early and late varieties of corn to spread the work of the combine harvester. For this reason it is useful to have a field or two of winter barley in place of wheat, as this ripens earlier than any wheats. This may be followed by early and medium varieties of wheat, such as Yeoman and Wilhelmina, with Swedish Iron as the last sown and last harvested.

Concentration on *essentials* is another point of good management. There are always a hundred and one jobs on a farm that want doing, and it is easy to be led astray. The weather never forgives, and the best farm manager is he who can best judge what is essential with the prevailing weather type.

Some farmers are adverse to early sowing of their corn crops, but forget that with large areas to be sown with a small staff it is better to be too early with some than too late with more. Wheat sown in early September makes a strong growth with good tillering, provided there is sufficient moisture for germination, and it is easier to harrow drastically a plant that appears too thick than it is to increase the population in a November-sown crop where starlings and insect pests have left only a thin plant. Manures should give better results on the thick crop than on the thin, but it is usually the latter that gets the help. Once a strong plant has been established, it should only fail from lack of food or lack of moisture at an essential time. The food we can supply by applying artificial manures as late as the middle of May, but the moisture is not within our control.

The question of manuring is necessarily an important one on mechanized farms, and here again good judgment is called for. Where combines are employed laid crops should be avoided if possible, but late application of nitrogenous manures may fail in seasons such as 1934 from lack of moisture in June and later. There appears to be no doubt that with liberal and systematic manuring, allied

MANAGEMENT AND MECHANIZATION OF FARMING

with the thorough and timely cultivations possible with mechanical equipment, crops well above the average of the country may be maintained.

If the preliminary survey has shown that the limiting factors are water-logging or acidity, large expenditure on manures is unavailing until these points have been rectified.

The tractor is the pivotal point of the mechanized farm, and the tractor capable of pulling four 12-in. furrows on average land appears to be the most economical unit.

The choice of tractors must necessarily depend on the capital available. Track-laying tractors are more expensive to buy than wheeled tractors of similar power, but their wider range of usefulness makes the expenditure worth while. For simple ploughing in dry, firm conditions, the wheeled tractors are as good as the track layers, but for secondary work such as disc harrowing, cultivating or drilling the wheels sink into the loose soil and cause unevenness. In very light soils in dry conditions, and in heavier wet soils after the first ploughing, they are prone to wheel-slip where a track layer would have no trouble.

It has been suggested that a second tractor is a cheap form of insurance on large farms even when one tractor should theoretically do the work. If the fallow area is to be cropped with sugar-beet or potatoes this second tractor may be of the row crop type, and fitted with a power take off for use with the mower and with a pulley for driving stationary machinery. Rubber wheels as spare equipment for the smaller tractors appear to be a good investment in many conditions, particularly where three tractors are justified on a large farm. During the summer the bulk of the work is light work that does not necessitate a full draw-bar load and a rubber-tyred Fordson is capable of pulling a 10-ft. combine harvester (with auxiliary engine) on level land. Such a tractor is very useful for shifting implements and machinery from one part to another of a scattered farm, or for doing a day's grinding, driving a drying fan, etc., and the large size of the rubber tyres increases its speed in all light work.

At present prices, live stock on a mechanized farm are a liability rather than an asset, but there are few farms that have not some proportion of grass land that has to be made productive, and live stock are the only agents for doing this. Starting with a mechanized milking system

MANAGEMENT AND MECHANIZATION IN FARMING

Mr. Hosier has shown us how mechanized dairying can be combined with extensive corn growing, but the state of the milk market does not appear to justify increasing our dairy stock. Rather should we adapt Mr. Hosier's open-air methods to produce beef and store stock. By sweeping hay into stacks in selected fields for winter use, and growing an area of marrow stem kale or mangolds in the neighbourhood, the cattle can if necessary be caked and foddered on the grass land as well as they can in yards. It is true that the arable fields will miss the dung, but we are relying on artificials to maintain their fertility, and for generations, particularly during the recent hard times, the grass land in arable areas has been neglected in favour of the arable, and it will now benefit in its turn.

Sheep can easily find their place on a mechanized farm, as successive crops of seeds, rape, rape and peas, marrow stem kale or thousand-headed kale can replace the swedes and turnips of the old horse-hoeing husbandry.

Mechanical appliances and artificial fertilizers offer us the means of conserving capital and cheapening production if properly utilized, but they cannot in themselves ensure profitable returns. An instinctive appreciation of the land, the weather, the markets, and the men and live stock under his charge, is essential in the make-up of a successful farm manager.

PROBLEMS OF FARM MANAGEMENT IN WHEAT PRODUCTION

J. A. SCOTT WATSON, M.A.,
*Sibthorpe Professor of Rural Economy,
University of Oxford.*

ANY scheme of farm management, to be regarded as successful, should satisfy four main conditions. (1) It should yield the normal rate of interest upon the invested capital; (2) it ought to provide for the adequate remuneration and general welfare of the employees, and encourage their skill and industry; (3) it should provide for the permanent maintenance of the fertility of the land; and (4) it should provide the manager with some return for his services. Provided that the first three conditions are satisfied it is reasonable to take the profits of management as a measure of the degree of success achieved.

It is not unusual to adopt other tests of the success of farming systems such, for example, as the gross output per acre, or the amount of employment provided. The level of output or of employment that may be desirable is, however, a question of State policy, which concerns the farmer no more than it does any other citizen. Another measure that is not uncommonly used is the margin between the cost of production of the thing produced and its selling price. For instance, if hay be produced at £2 10s. per ton and sold for £3, the profit margin is 20 per cent., while if potatoes cost £4 per ton to grow and are sold at £4 5s. the corresponding margin is only $6\frac{1}{4}$ per cent. It is, however, wrong to argue on the basis of these figures that the one enterprise is more profitable than the other, for if the yield of hay be 30 cwt. per acre and that of potatoes 8 tons it is clear that the profit on the latter crop would be £2 per acre against only 15s. per acre on the former. Again, however, the higher profit margin per acre is not conclusive evidence in favour of the potato crop, for it might well be that the production of an acre of potatoes required the use of fully three times as much capital, and occupied more than three times the amount of the manager's time, compared with an acre of hay. In other words, thirty acres

FARM MANAGEMENT IN WHEAT PRODUCTION

of hay might produce a larger net return, both on capital and on the work of management, than ten acres of potatoes.

Wheat, compared with other cash crops, produces a relatively low gross output per acre. For example, a specialized wheat farm, growing a crop of 30 bushels per acre on two-thirds of its land (the remaining third being fallow) has an output of 20 bushels per acre of total area. Taking the selling price at 42s. per quarter the gross value of the corn is no more than £5 5s. per acre of total area. Thus, even with a high margin of profit per quarter, it is obvious that a large area must be farmed in order to yield adequate remuneration for a skilled farmer or manager. On the other hand the wheat crop is perhaps better suited than any other to large-scale mass-production methods and requires, for an arable crop, a minimum of detailed supervision.

According to Carslaw and Jolly¹ the average cost of production of wheat in the years 1930, 1931 and 1932, on a large number of farms in the Eastern Counties, was 38s. 3d. per quarter—without allowing for the value of the straw or tail corn but excluding interest on capital. Again, taking 42s. as the selling price, it is obvious that the production of a matter of a hundred quarters of wheat, at the average cost, can make no very large contribution to the farmer's income. The possibilities of securing a substantial contribution from the crop appear to be three, viz.:—

- (1) To bring down production costs to a figure that shall be substantially lower than the average quoted above;
- (2) To turn the main by-product—the straw—to some income-producing purpose; and
- (3) To increase the size of the management unit to something much larger than has been usual. Taking again the specialized wheat farm, organized on the plan indicated above, an income of £500 per annum would be secured, with a profit of 3s. 9d. per quarter, on an output of some 2,500 quarters, involving the use of about a thousand acres of land.

It is proposed to examine these three possibilities in turn.

(1) **Production Costs.**—*Size of the Production Unit.*—It is well known that in many productive processes there is a certain optimum size of production unit and that, in particular, serious inefficiency may arise if operations are

¹ *The Farm Economist*, Vol. I, No. 6, 1934.

conducted upon too small a scale. This is undoubtedly true as regards the size of the cereal area upon a particular farm. It is submitted below that the combine harvester (with a grain dryer) constitutes, upon the whole and at present, the most economical equipment for harvesting. Now although smaller types of combines than those at present in use are or will shortly be available, the bulk of British experience has been so far with a relatively large (10-ft. cut) machine, carrying its own engine.

This machine is usually the most costly item of equipment on the farm, and it is clearly desirable that it should be used nearly up to its capacity. This capacity varies with the bulk of the crop and also according as it is desired, or not, to collect the bulk of the straw. With light to average crops, where little trouble may be expected from lodging, and if the whole of the straw is not to be collected, an area of at least 350 acres (of all or any of the cereals) is within the capacity of the machine—at any rate in the east, midlands and south of England.² On the other hand, if the straw is to be cut at ordinary stubble height the greater bulk passing through the threshing mechanism slows down the speed of operations, and under such circumstances 250 acres of average corn crops would probably leave no more than the necessary margin of safety against the possibility of delay due to wet weather or accident.

This area of cereals, along with perhaps half as much under other crops or bare fallows, is from other points of view a convenient unit. It will employ one large corn drill, and either two rather high-powered tractors, or two medium-powered ones and one light one.

As regards the size of fields, little is to be gained by having these larger than 15 or 20 acres. Thirty- or 40-acre pieces are still quite convenient, but with a tank combine 60- or 70-acre fields are undesirably large, since arrangements must then be made to empty the grain-tank more than once in the round.

Power Equipment and Tillage.—Without going into details about types of tractors it may be said that experience points to a medium-powered tractor, capable of drawing four or five furrows, as the best general-purpose power unit. Such a tractor is capable of drawing a drill, cultivator or

² On the farm with which the writer is personally concerned 300 acres of wheat, yielding 1,195 quarters, and 36 acres of barley, were harvested by one combine harvester between July 29 and August 23, 1934.

FARM MANAGEMENT IN WHEAT PRODUCTION

drag-harrow of quite as large a size as is conveniently manageable. It is also more than adequate for towing the combine. There are certain important operations in regard to which it is desirable to have three power units at work simultaneously—e.g., at planting time when one may be employed in preparing the tilth, another in drawing the drill and a third harrowing after the drill.

The economy of the medium-powered tractor, as compared with either the horse or the light tractor, is very marked in the case of all such tasks as ploughing, cultivating, harrowing and rolling. As an illustration the figures recently published by J. R. Lee³ may be quoted. This author gives the cost of ploughing with two horses and a single-furrow plough as 12s.; with a light tractor as 9s. 1½d.; and with heavy tractors (15- and 20-h.p. Caterpillars) as 5s. 2d., per acre. Corresponding economies are achieved in the other main tillage operations and a substantial, though smaller, saving in drilling.

Where large level fields are in question there is no doubt that round-the-field ploughing is the cheapest method, leaving diagonals instead of headlands to be ploughed out at completion. This system, of course, does not readily admit of subsequent cultivation at right angles to the direction of the furrows, but harrowing, etc., may be done in a diagonal direction, which is not unsatisfactory. With ridge-and-furrow land the multi-furrow plough is at a disadvantage in setting out the lands and finishing the open furrows, and under such circumstances it is advantageous to have one light tractor, drawing a two-furrow plough, working in conjunction with two or three medium or heavy tractors. The latter can then be kept continuously at straightforward work.

Apart from ploughs the other tillage implements required are a suitable set of harrows, a multiple roller (which may have an over-all width of the order of 30 ft.), and at least two other tools. One of these may well be a disc harrow, which is very valuable for producing a rough, firm tilth on recently-ploughed land; the other may be a cultivator or else a pitch-pole or other heavy type of drag harrow. Alternative equipment is described in various recent publications.⁴

³ *The Farm Economist*, Vol. I, No. 6, 1934.

⁴ See for example, Newman, "Notes on the Technique of Mechanized Farming," Institute for Research in Agricultural Engineering, University of Oxford, 1934.

FARM MANAGEMENT IN WHEAT PRODUCTION

Sowing and Harvesting.—The drill commonly used is about 14 ft. in width, carrying about 28 coulters and capable of covering about 30 acres during daylight hours in the wheat-sowing season. In some cases combined seed-drills and manure-distributors are employed, and there is some evidence that their action, in placing the fertilizer in direct contact with the seed, is beneficial. This point is discussed below. From other points of view these machines have disadvantages. There are two sets of mechanism to go wrong, and a fault or breakdown in one holds up the double operation. Extra time is spent in filling, so that the area covered per hour is reduced. Moreover, the machine with both hoppers filled to capacity is sometimes undesirably heavy, and if it is not so filled, frequent stops are necessary for replenishing.

At harvest the fields are "opened" by a binder and the combine is then set to work. The proper stage of ripeness is of some importance, and is reached in four or five days after the crop would be considered fully binder ripe. If the crop is standing and is free from green weeds the task of the combine is easy, whatever height of stubble may be desired. The ordinary combine can cut quite as low as the binder. The presence of green weeds in the bottom is troublesome only if a short stubble is to be made. Tall green weeds in quantity make it necessary to cut the crop, leave it in windrow for a day or two and then thresh with the combine carrying a pick-up attachment.

In the writer's opinion the grain-tank fitting on the combine is preferable to the sacking apparatus, as a man's time is saved, and the subsequent man-handling of sacks from ground level is avoided. The grain from the tank can be discharged direct into a lorry or trailer for conveyance to the dryer, and it is unnecessary that the combine should be stopped for the purpose—the vehicle merely travels alongside the combine during the three or four minutes required for the transfer. The straw is left in windrow if it is to be subsequently collected. If it is intended to be ploughed in it may be scattered by means of a straw-spreader attachment on the combine.

The use of a grain dryer is of course practically essential, and its capacity should be such that it can extract about 6 or 7 per cent. of moisture from the corn while dealing with this at the rate of about 30 cwt. per hour, which represents about the average output of the combine. In an

FARM MANAGEMENT IN WHEAT PRODUCTION

emergency, when cutting is done when the grain has a very high moisture-content, the dryer can be run for an hour or two in the evening, after " combining " has ceased for the day. It is necessary to bring the moisture content of the grain down to about 16½ per cent. in order to be quite certain that it will keep in bins or sacks. A quick method of testing for moisture content has been devised by the Oxford Engineering Institute.⁵ A sample of the grain is ground and shaken up with a known quantity of alcohol of known specific gravity. The alcohol, containing the moisture extracted from the grain, is then filtered off, and another hydrometer reading gives the moisture content of the grain. Actually a skilled labourer, after a few tests, is able with surprising accuracy to estimate the moisture content by the " feel " of the grain, and only occasional check-tests are necessary. The grain should be re-dressed after drying.

Various alternative new methods of harvesting are at present being tried experimentally,⁶ but it is too early to attempt exact comparisons with combining.

Manuring.—Where wheat or other cereals constitute the chief or only crop on a particular area the common rotations are bare fallow—wheat—wheat or bare fallow—wheat—wheat—barley. In some instances " seeds " of varying duration, either for hay or grazing, are being introduced. In any such circumstances dung is not available for any considerable proportion of the cereal area, and in any event it is difficult to see an economic return from applications of farmyard manure to wheat if the labour cost of its application be added to the money value that is ordinarily placed upon it. If reliance be placed upon artificials alone, it is obvious that these should contain all three of the main manurial constituents. The phosphate and potash may be applied at sowing time or before, but the greater part or all of the nitrogen should be reserved until spring. In certain cases the whole of the mineral manures for a rotation are applied in the course of the summer fallow and the only other manuring is the spring top-dressing with nitrogen. This is ideal from the point of view

⁵ " A Rapid Method for Measuring the Moisture Content of Wheat," by W. H. Cashmore, Institute for Research in Agricultural Engineering, Oxford, 1933.

⁶ See, e.g., Rayns, " Two Decades of Light Land Farming," Jour. R.A.S.E., Vol. 95, 1934; and Orwin, " Pioneers of Power Farming," Oxford Agricultural Economics Research Institute, 1934.

FARM MANAGEMENT IN WHEAT PRODUCTION

of labour organization, but there is a good deal of evidence, especially from Russia,⁷ that the manures are more efficient when applied with the seed, and actually in the drills with the latter.

The practice adopted by the writer is to apply one of the new concentrated fertilizers, containing only a small percentage of nitrogen (22.5 per cent. soluble phosphoric acid, 13 per cent. potash and $6\frac{1}{2}$ per cent. nitrogen) with the seed; the quantity being of the order of 1 cwt. after the bare fallow and 2-2 $\frac{1}{2}$ cwt. for second wheat crops. Such of the wheat as has lost plant in the winter, or is looking starved and yellow in spring, has an ordinary application of sulphate of ammonia in March. If, on the other hand, the general appearance of the crop in spring is satisfactory, the nitrogen is withheld until early May, when a quick-acting compound such as nitrate of soda or nitrochalk is used. The chief risk, with the second wheat crop especially, but even with the fallow crop after a wet winter, is that the plants will use up the bulk of the available soil nitrogen in the formation of straw, and will be starved at the time when they ought to be filling the grain. The late application of nitrogen is intended to prevent this state of affairs, and it would seem to be specially important where organic manures are not used, and where therefore there is no considerable progressive release of nitrogen in the soil during the growing season.

Labour Organization.—The number of fully skilled key men required for a production unit of size indicated (about 300 acres of cereals with 150 acres fallow) may be either two or three, according as the power equipment consists of two large tractors or two medium and one small. The choice, as between two and three, depends on a variety of factors. With the more difficult types of soil, where the timing of operations is specially important, the third tractor is of considerable value, especially in autumn. This regular staff must be supplemented by one additional man (to tend the drill) during the planting season. At harvest the minimum staff is six in all—one on the combine and one on the tractor towing it; another with a tractor and trailer conveying the grain from the field; a fourth attending to the drying and grain-dressing plant; a fifth sacking the corn; and a sixth man, capable of driving a tractor, to

⁷ See Sir E. J. Russell, "The Farmer's Guide to Agricultural Research in 1934," p. 178, R.A.S.E.

FARM MANAGEMENT IN WHEAT PRODUCTION

relieve the men for the short meal intervals. If there is a haul of more than about half a mile from the field an additional man and conveyance are necessary. Again, if the collection of straw is to go on simultaneously with the "combining," an additional staff of at least two people is required.

Apart from the sowing and harvesting periods, which last, on the average, about a month each, the regular staff is fully adequate for all purposes. Indeed, unless work like ditching, hedging, etc., is available there may be difficulty in finding remunerative employment during the winter. The working of 150 acres of bare fallow during the summer is also under the capacity of the labour force, but it is important to effect a really thorough fallow, and to this end the various operations must be done as nearly as possible at the optimum times.

Combination of Wheat Growing with Other Crop Enterprises.—There is a growing tendency upon mechanized wheat farms to cultivate other crops, but these must be chosen with care if they are to improve the efficiency of the farm as a whole. For instance, potatoes and sugar-beet compete for the available man and mechanical power during the critical wheat planting period. Any large area of roots, grown on existing methods, would require a large amount of casual labour for singling, etc., while tractor power is not well adapted to work like root carting. A proportion of spring-sown cereals, which may be greater or less according to the area of wheat that the autumn weather permits to be sown, provides an obvious way of spreading the work of tillage and planting. Upon the whole, however, the other crops should be those that provide employment, at least for the men and if possible also for the tractors, during the periods April-June and December-February. An area of 50-100 acres of hay could probably be managed by the regular hands, and would justify the purchase of mechanized hay-making equipment (sweeps and stacker), which would find a second use in the collection of straw. Kale, for winter sheep feeding, is another possible crop, and cruciferous and other vegetable crops might well come in. If an area is to be devoted to vegetables (or possibly to fruit) some live stock will be necessary to provide dung. On the whole it would seem that 300 acres of corn would combine well with perhaps 80 acres of hay, and 20-30 acres of fallow crops of sorts, either for sale or for stock feeding.

FARM MANAGEMENT IN WHEAT PRODUCTION

Finally, it may be said that there are good theoretical reasons in favour of growing green-manuring crops, such as mustard, on a portion of the bare-fallow area; but if these are to interfere with the primary task of weed destruction they may not be worth their place.

The Utilization or Disposal of Straw—In many areas there is practically no market for straw, the net return after meeting the cost of collection and baling being negligible. Schemes for the erection of strawboard factories in the main corn-growing areas have been discussed, but no practical steps seem yet to have been taken.

Unless, therefore, the wheat farmer is prepared to keep housed live stock upon a considerable scale he is faced with the alternatives of (a) burning the straw on the ground, or (b) ploughing it in.

(a) If the straw is burnt, weed-seeds are largely destroyed and the straw is got out of the way of subsequent tillage operations; but the organic matter is lost to the soil. (b) Ploughing-in is practicable (except with very bulky crops) if a stubble of about a foot in height is left at cutting, and if the remainder of the straw be well scattered. The ploughed-in straw, however, produces a tilth that is too "hollow" for autumn planting, and gives trouble with the drill coulters. The writer's present practice with unwanted straw is to burn it where a corn crop is to follow, but to plough it in where the land is intended for fallow in the succeeding year. During the fallow year the straw probably acts as a "trap" for the nitrates that are formed, and it seems largely to decay during the period of growth of the subsequent crop.

The large numbers of straw stacks at present standing about in the bullock-feeding areas bear witness to the unprofitableness of the traditional method of converting straw into dung. Pigs are a possibility, but the amount of straw required is rather limited; probably a herd of some two thousand head would be required to utilize fully the straw from 300 acres of cereals. The making of artificial farm-yard manure by the Adco process is another possibility, but this seems to be practicable only when the straw can be swept to a point where water is available in quantity; otherwise the labour of water carting makes a serious addition to the cost. To a considerable extent then, the whole problem of straw disposal still remains to be solved.

FARM MANAGEMENT IN WHEAT PRODUCTION

The Unit of Management—The production unit as outlined above does not constitute a farm in the sense of providing full-time employment, in management, for the farmer. Actually it entails close personal attention only during the harvest season. At wheat-planting time an appreciable, though much smaller, amount of time must be given to supervision, but for nine months of the year the great bulk of the routine may be left to an intelligent foreman, who of course would be a tractor-driver. The management of two units, of the size indicated, by one individual would be possible, but probably a much more satisfactory arrangement would be to combine the cereal unit with two or perhaps three others upon a somewhat similar scale as measured by the number of men employed. The choice of these additional enterprises would of course depend upon a variety of circumstances, the only essential point being that none of them should require a large amount of detailed supervision in the cereal harvest season.

SEED TESTING

The Value of Testing.—Farmers generally are well aware of the risk accompanying the sowing of untested seed. While the resultant crop may be largely dependent upon weather conditions and proper cultivation, yet the quality of the seed used is of primary importance. The cost of the seed may be small compared with other expenditure on the crop, but its value is greater than is indicated by its market price. Poor or worthless seed may lead to serious loss of time and money, and seed testing should be regarded as a necessary item of insurance against such a loss.

Purity.—The purity of a sample is determined by the actual percentage of pure seed by weight, but it is also important that attention should be paid to the nature of the impurities reported. When these consist merely of inert matter, such as broken seeds, seeds that contain no kernel (in grasses), chaffy matter and soil, or even of other useful seeds, they cannot be regarded as a very serious matter. When, however, the impurities consist largely of weed seeds, the farmer should be on his guard. Seeds of certain weeds are scheduled under the Seeds Act, 1920, as "injurious," and where more than 1 per cent. of these seeds occurs in a sample of clover, or more than 2 per cent. in a sample of grass, this fact has to be declared by the seller. *It is illegal to sell or knowingly to sow any seeds to which the Seeds Act applies if they contain more than 5 per cent. of injurious weed seeds.* The scheduled injurious weed seeds are those of Docks, Sorrels, Cranesbills, Wild Carrot, Yorkshire Fog and Soft Brome Grass. There are many other weeds, however, the presence of which is almost equally undesirable.

The seeds of common weeds vary so much in size that a mere statement of the percentage by weight present conveys little idea of the damage that they may do. If 1 lb. of grass or clover seed contained 1 per cent. by weight of weed seeds, the approximate number of such seeds present would be as follows, for the varieties shown, viz., European Clover Dodder 18,000; Sheep's Sorrel 10,500; Yorkshire Fog (in glumes) 8,900; Wild Carrot 4,400; Dock 3,200. Should, therefore, a Red Clover sample contain, say, only

SEED TESTING

0.1 per cent. by weight of European Clover Dodder, each pound of the "red clover" seed would contain 1,800 seeds of dodder; if 8 lb. of red clover were sown per acre, this would mean 3 dodder seeds per sq. yd. over the whole area sown.

It should be noted that, in a general way, impure seed does most harm when introduced in mixtures of grasses and clovers, the product of which may occupy the ground for from 18 months to several years, or when sown with cereals or vetches, crops which, although not occupying the ground for long, are difficult to keep weeded. It is even more important to sow pure seed on poor land than on good land; for on poor land the seeds do not "take" so quickly nor does the turf knit so closely together, thus giving the weeds more chance of establishing themselves.

Dodder.—Under the Seeds Act, the presence of dodder must be stated if it occurs to an extent exceeding one seed in 4 oz. of the larger clovers or in 2 oz. of the smaller clovers. In appraising the value of a sample containing dodder, it must be borne in mind that the parasite is much more likely to cause serious damage in the south of England than in the north.

Germination.—A germination test is made on pure seed, after the removal of impurities during the purity analysis, and the result is given as a percentage by number. High germination is desirable, but small differences of 2 or 3 per cent. in the germination of a sample are of little importance beside such considerations as strain, weed-seed content and climatic origin.

In using seed of really low germination, however, there is the danger that many of the seeds are likely to be weakly, and cannot be expected to produce strong and healthy seedlings; so that a large increase in the seeding per acre of such samples cannot be relied upon to produce a "plant." A poor germination may result either because the seed (a) consists largely or entirely of old seed, (b) has matured under adverse conditions, or (c) has been harvested in unfavourable weather.

Seeds that have matured or been harvested under adverse weather conditions, although sometimes showing a moderate germination capacity, frequently produce an unsatisfactory plant. Farmers should be particularly careful in the use of their own home-grown cereals and red clover

SEED TESTING

seed, which, especially if badly harvested, should be sent for testing to the Official Seed Testing Station before sowing. Sometimes it may suffice to add to the normal seeding per acre; at other times the seed should be rejected altogether for sowing.

It is the practice of the Official Seed Testing Station to issue an interim report on the germination of a sample after it has been in test for 4, 5, or more days, according to the class of seed. An interim report may prove a very helpful guide as to the "strength" of the seed. For example, one sample may germinate 60 per cent. in 5 days, and another, 90 per cent. in the same period, though both may grow 95 per cent. during the full period of the test. It would obviously be better to sow the seed that grows 90 per cent. in 5 days because its more rapid growth indicates that it would produce more vigorous and sturdy plants more quickly than a sample that germinates only 60 per cent. in the five days. With freshly harvested cereals, however, rapidity of growth is not necessarily a measure of the seed's vitality.

Hard Seeds.—Parcels of clover, sainfoin, lucerne and trefoil seeds may contain "hard" seeds, i.e., seeds that at the end of a germination test have not sprouted, swollen, nor rotted. They are not necessarily dead seeds, and many of them would eventually germinate in the soil.

A comparatively high percentage of "hard" seed often occurs in samples that are otherwise excellent; indeed, high percentages of hard seed are more often met with in well-harvested samples than in poorly-harvested ones. In general, "hardness" in clovers is of less importance when they are used for long duration leys (e.g., in wild white clover) than when used for ordinary rotation sowing.

Sampling.—Apart from the requirements laid down by the Seeds Act, 1920, as regards the testing of seeds, it is becoming increasingly general for farmers to obtain from the Official Seed Testing Station, Cambridge, reports upon samples of seed that they are proposing to sow. As an analysis can only show the quality of the sample submitted for test, it is clearly most important that any such sample should accurately represent the bulk of the seed from which it was drawn. A memorandum (Form A. 865/C.C.) on the drawing of samples for testing is obtainable, free of charge, from the Ministry.

SEED TESTING

The Seeds Act, 1920, and Seeds Regulations, 1922.

—The sale in this country of agricultural seeds, of the principal garden seeds, and of seed potatoes is now regulated by the Seeds Act, 1920, and by the Seeds Regulations, 1922.

Briefly, the Act and the Regulations make it necessary for a seedsman or farmer, when selling or offering for sale for sowing any of the kinds of seeds scheduled in the Regulations, to declare in writing to the purchaser at or before the time of sale or delivery, certain essential particulars as to the quality of the seed in question, such as the percentage of purity, percentage of germination, presence of injurious weeds, etc. The particulars required to be declared in respect of seeds, other than garden seeds, must be ascertained by a test carried out either at an Official Seed Testing Station or at a private testing station licensed by the Ministry.

Farm Sales.—It is most important for farmers to note that, in selling seed corn or any of the scheduled kinds of seed intended for sowing, such as red clover, tares, etc., they are in precisely the same position as the seedsman and are bound to supply the same guarantee. Thus a farmer selling a sack of home-grown clover seed to a neighbour for sowing must, in the first place, have a sample tested at an Official Seed Testing Station, and supply the buyer, in writing, with the required particulars not later than the date on which the seed is delivered.

A summary of the requirements of the Act and Regulations (Form No. 728/C.S.) may be obtained, free of charge, on application to the Ministry.

The Official Seed Testing Station for England and Wales is situated on the Huntingdon Road, Cambridge. The charge to a farmer for testing a sample of seed for his own information is the nominal fee of 6*d*. The charge for testing a farmer's sample as the basis of a declaration for sale, is on the same scale as that charged to seedsmen, full details of which, together with particulars of the weights of samples to be sent, are set out in Form No. 728/C.S. mentioned above.

SPRING-SOWN OATS IN WALES

E. T. JONES, M.Sc.,

Welsh Plant Breeding Station, Aberystwyth.

THE more widely-grown varieties of spring-sown oats may for practical purposes be divided into three main grades or groups, depending upon their general suitability to conditions of high, medium and low productivity.

In the first grade or group we may include Victory, Record, Abundance, Marvellous, Supreme and Superb; in the second, Radnorshire Sprig (=Black Sparable), Black Bell III, Scotch Potato and Black Tartarian; and in the third, Ceirch-du-bach (=Welsh Sprig) and Ceirch Llwyd (= *Avena strigosa*, *Blewgeirch*, *Ceirch Teify*).

Such a grouping takes into consideration the fact that varieties respond differently at different levels of fertility, varieties that give highest yields under good conditions seldom giving the best results under conditions of low productivity. Experimental data show that where the expectation of yield from a variety like Record or Victory is of the order of approximately 18-20 cwt. and upwards of grain per acre, the highest returns are on an average obtained by growing a variety belonging to the Grade I group. Where the cropping expectation is likely to fall below that level for a variety of Victory or Record type the highest yields of grain and straw are more probably to be obtained by growing a variety of the Grade II group. As the cropping capacity continues to fall so does the advantage in yield turn more and more in favour of Grade II varieties, until at about the 10-cwt. level the advantage rests with a member of the Grade III group.

The problem of the choice of the right variety to grow would be simplified were it possible to say that Grade I varieties are the best and most suitable for the valleys and low-lying lands, Grade III for the uplands and Grade II for the areas lying in between. This, while true in a general way, needs qualification, for although land of high productive capacity is generally found in the lowlands and valleys it is not entirely confined to such areas, nor is land of low fertility invariably and only found in upland and exposed positions. In making a choice of variety, there-

SPRING-SOWN OATS IN WALES

fore, each field has to be judged upon its individual merits and according to its expected productivity.

Change of Variety.—With new varieties introduced into a district for the first time the more advisable procedure is to purchase in the first year only sufficient seed to sow a strip, or part of a field, and to sow the remaining area with the home-grown variety, rather than to buy enough seed to sow out the whole field with the new sort. Such a method is a frequent practice in many districts and is deserving of wider adoption.

The new variety when tried for the first time may perhaps do very well, or may do very badly, depending on season, soil and various other factors, and unless there is an area of oats alongside of the farmer's own usual variety (which should be sown at the same time and under similar conditions of cultivation and fertility) he is without a standard of comparison by which to decide whether he would have had a better or a worse crop had he grown his own accustomed kind. It is of course important that his home-grown seed shall be an average good, plump and well-ripened sample, so that it is not at any disadvantage in this respect compared with the new variety. If, in the first season, he is reasonably satisfied with the new kind, then he would do well to continue his comparison in a similar manner for one or more seasons, using, on these occasions, his own harvested seed of both varieties. He is then in a position to decide upon the merits of the new variety, and whether to abandon the old in favour of the new.

This may seem an unduly cautious procedure to adopt. It is, however, considered necessary owing to the fact that the relative yield of a variety and the quality of its grain vary somewhat from season to season. The comparative value of a variety has in consequence to be assessed on its average behaviour over a number of seasons, of which three would be a minimum. There are, however, exceptions to this. Thus, in the case of a new variety possessing a very definite increased resistance to lodging, a farmer who had experienced considerable losses from this cause would be justified in changing-over in favour of the new variety in one sweep. Before doing so, however, he would be well advised to consult his County Agricultural Organizer, or the results of critically-conducted trials, and satisfy himself that the new variety is definitely superior to the old in this respect, as well as being reasonably good in other ways.

Similarly with winter oats, where varieties of established resistance to winter killing are available, a complete change-over from a variety unsatisfactory in this respect to the more hardy form would be permissible. In the absence of satisfactory evidence of this kind, however, the introduction of a new variety on a limited trial basis is a sound practice that permits the farmer to maintain a high standard of yields from the area devoted to oats. The quantity of seed required for this purpose need not be more than 1 to 1½ cwt. for any individual field comparison, and the cost is, therefore, relatively small.

In certain parts of the Principality, when two oat crops are taken in successive seasons, and the crop, both grain and straw, is required solely for feeding to stock on the farm, a Grade I variety is often grown in the first year,

SPRING-SOWN OATS IN WALES

followed by a variety of the Grade II or III groups in the second. Occasionally in place of the latter a mixture of several varieties is used. This may consist of one or more varieties of each of the three grades or groups, and may be made up of approximately equal proportions of say Golden Rain, Black Bell III, Black Tartarian, Scotch Potato and Ceirch Llwyd (*A. strigosa*). Both of these methods are not infrequently practised in parts of Cardiganshire, where, as in many other Welsh counties, the area under oats in proportion to wheat and barley is high, and where in consequence oats frequently follow oats in the rotation. This is often so on soils of medium or low fertility. Where like conditions of requirements and fertility prevail, the employment of Grades II and III varieties in this manner is a good and sound practice that merits more extended usage.

New Varieties.—In the Grade I class, Star, Eagle, Golden Rain II and Elder are recently-introduced varieties that are giving a good account of themselves in critically-conducted trials. Star and Eagle are white-grained oats bred at Svalöf to take the place of that excellent and widely-grown variety Victory (also a product of the same research institution). Both, on an average, outyield Victory and resist lodging slightly better, while Star is a few days earlier in ripening. Growers of Victory may therefore well choose one of these as a new variety to try. Of the two, Star possesses the plumper grain, while Eagle shows promise of being the heavier grain cropper. Golden Rain II, also a Svalöf oat, is an improvement upon Golden Rain, has a wide range of adaptability, and while bred for a level of fertility slightly below that of Victory or Star is capable of outyielding Victory even on land of good productivity. The grain is good, yellow in colour, and of medium size, and the straw is of good feeding quality. It is a variety worthy of trial on land in medium and fairly good fertility.

The variety Elder stands in a class by itself. Produced by the Scottish Station for Research in Plant Breeding, it is the most stiff-strawed of all the spring varieties now on the market. It is essentially an oat for land in a high state of fertility where yields or 26 cwt. and upwards of grain are expected, and where lodging is a troublesome evil. The grain is white and plump, but not large. This variety is

SPRING-SOWN OATS IN WALES

somewhat slow-growing in the early stages and ripens very slightly later than Victory. The straw is not long, nor is it, for a stiff-strawed kind, excessively coarse.

In the Grade II group the new variety Englebrekt merits trial. This is a black-grained oat possessing good quality straw that stands reasonably well. The grain is large, a little long pointed and rather freely awned, but has a good kernel. It ripens at about the same time as, or very slightly earlier than, Black Bell III, and as an oat to produce on medium land a good quantity of grain and straw for home consumption it should not be overlooked. Even under slightly better conditions its yield of grain compares quite favourably with that of some members of the Grade I group. Judging from preliminary trials, it appears to be an oat with a wide range of adaptability. Its chief drawback lies in the appearance of its grain.

Of Grade III varieties there are now available to the farmer two new pure lines of Ceirch-du-bach (S.79 and S.80) and two of Ceirch Llwyd (S.76 and S.78) produced by the Welsh Plant Breeding Station. These are improved strains isolated from the old commercial varieties of the same name, which they surpass in yield under poor upland conditions. In this respect the Ceirch Llwyd strains in particular are a decided advance. They are outstanding as varieties for very poor land.

Change of Seed.—Provided the fertility of the soil is being maintained, change of seed should mean nothing more and nothing less than a change for a better "seed" sample of the *same* variety. Where the home-grown seed is thin, poor and unevenly filled, or damaged by heating in the rick, or weathering in the field, the necessity for change of seed is generally urgent. When, however, the home-grown sample is true to type, plump, dry, well-ripened and of good colour, and has not been subjected to too much rain or prolonged moist conditions during the period just previous to cutting, and in the stook, yield trials show that little advantage in yield is gained simply by change of seed. A contrary belief is, however, occasionally held, but, wherever the problem has been investigated by appropriate trials, differences of only an insignificant kind have hitherto been obtained. A slight gain in earliness of ripening when the seed has come from an earlier district is sometimes apparent.

There are districts, however, in which good seed is not,

SPRING-SOWN OATS IN WALES

or only very seldom, produced, and where a change from time to time proves advantageous. In these cases also change of seed as and when necessary should be a change for seed of the *same* variety. This may be obtained from areas enjoying more favourable seed-producing conditions. Providing, therefore, that the farmer is already growing the variety best suited to his farm, his problem of change of seed is simplified. Further, in such circumstances he need only be concerned with the problem of change of variety as and when such new sorts appear on the market. Nothing is to be gained simply by changing, for example, from Victory to Record, or Abundance, or like varieties, when once the grower has discovered for himself that Victory is the best of these for his particular conditions.

Variety, therefore, should not enter into the "change of seed" problem, which, as already indicated, should be confined to procuring a better seed sample of the same variety. If, however, the grower is in doubt as to whether he is growing the best of existing *varieties* for his particular conditions, then the alternative kinds should be investigated by small trials.

Seed Treatment.—Although widely practised with wheat, seed treatment of oats is not very frequently carried out. There are, however, now on the market several brands of mercuric compounds in powder form, which are giving very promising results. Some experiments with these conducted at the Plant Breeding Station and in the counties by the present writer in co-operation with Mr. D. Walters Davies, the Advisory Mycologist, indicate that beneficial results are most likely to be obtained on land where in practice heavy seed rates are usually necessary in order to obtain a reasonably dense braird. Disinfection of the seed by treating it with one of these compounds has, under such conditions, given an improved brairding establishment. Treatment also results in a reduction of the fungoid diseases in the crop and in a slight saving in the amount of seed to be sown. A strip of treated seed sown alongside an untreated portion should give a farmer useful first-hand information. The cost of the compounds is low, being less than 1s. 6d. per acre.

OBSERVATIONS ON POTATO-SICK SOILS IN DEVON AND CORNWALL

A. BLENKINSOP, B.Sc.,

Advisory Chemist, Seale-Hayne Agricultural College.

THE spread of the potato eelworm disease in Devon and Cornwall during the last few years has been no less rapid than elsewhere in the country, and has been no less devastating in its effect. In these two counties the crop is not confined to any particular district, but is spread more or less evenly over the whole area, and is seldom grown year after year on the same land except in allotments and small gardens. Practically all the cases of the disease brought to the notice of this College have occurred on small plots of this category. Some allotments, however, showed marked difference in respect to the disease between plots cultivated by different growers. Some were obviously badly affected, and others adjoining not affected at all, although there was every reason to expect the spread of the parasite indiscriminately throughout the whole soil of the gardens in question.

In view of these observations it was decided to make an analytical survey of soils from all the gardens where the disease was reported, and to examine samples from "good" and "bad" plots in allotments where the above phenomenon was noticed.

The data thus obtained suggested that there was apparently some adverse soil factor involved, and that this in most instances could be best described as a condition of excessive lack of balance. Some twenty to thirty samples of severely affected soils were alike in this respect. The following figures give some idea of the chemical data obtained, which provided the basis of the diagnosis, and which suggested a method of remedial treatment:—

Locality	pH	Loss on ignition %	Nitrogen %	Total phosphoric acid %	Available phosphoric acid %	Exchan- geable potash %	Free Car- bonate of lime %
Bridport, Devon ..	5.73	8.69	0.342	0.415	0.113	0.021	—
Topsham, „ ..	7.04	7.54	—	0.365	0.188	0.010	6.77
Bugle, Cornwall ..	7.43	14.46	—	0.408	0.126	0.028	6.42
Gulval, „ (severe)	8.11	6.18	—	0.369	0.203	0.019	1.04
„ „ (slight)	8.95	8.79	—	0.390	0.164	0.039	1.69
North Molton, Devon	6.97	13.45	—	1.545	0.581	0.010	0.92
Barnstaple, „	7.70	16.45	—	0.576	0.179	0.013	0.88
Braunton, „	7.31	5.07	—	0.591	0.216	0.029	1.83
Torquay, „	7.41	—	—	—	0.152	0.026	5.50

POTATO-SICK SOILS IN DEVON AND CORNWALL

It will be clear from the above that these soils belong to the class of high phosphate and low potash levels, as explained in a previous article in this JOURNAL (October, 1933). It was assumed that exceptional unbalance required abnormal treatment in order to rectify it, and that with a high phosphate-potash ratio in the soil a disproportionate quantity of potash would be needed for this purpose.

An opportunity of testing out this conception presented itself in 1933 on a small railway allotment near Newton Abbot, where the spread of the disease had been observed during the previous two or three years. A plot of 24 ft. by 34 ft. was planted in April and dressed with dung and potato manure containing phosphates and nitrogen, with potash equivalent to about 3 cwt. of sulphate of potash per acre. On April 13, about ten days after planting, half the plot was given sulphate of potash at the rate of nearly 12 cwt. per acre. This was worked into the soil by hoeing and forking and subsequent earthing up. The result was striking from the time the leaves appeared above ground, and became more so during the period of growth. The photographs were taken on June 21. The crop was lifted in late September and weighed on October 18 as follows:—

Plot 1.—F.Y.M. plus potato manure	..	1 ton 12½ cwt. per acre
Plot 2.— „ plus „ „ plus	14 tons 0½ cwt. per acre	
Sulphate of Potash	12 cwt. per acre	

The whole of the potatoes on Plot 1 were small in size and valueless for cooking, whereas on Plot 2 there were practically no chats. The variety was Majestic.

The analyses of the soil on the two plots after treatment for the 1933 crop were as follows, and indicate the extent to which the high phosphate-potash ratio had been reduced by the treatment on Plot 2:—

	pH	Loss on ignition %	Total phosphoric acid %	Available phosphoric acid %	Exchange- able potash %
Plot 1.	7.64	7.02	.404	.110	.010
Plot 2.	7.66	7.85	.380	.116	.053

$$\text{Plot 1. Phosphoric acid/Potash} = \frac{0.110}{0.010} = 11.0$$

$$\text{Plot 2. Phosphoric acid/Potash} = \frac{0.116}{0.053} = 2.2, \text{ which is}$$

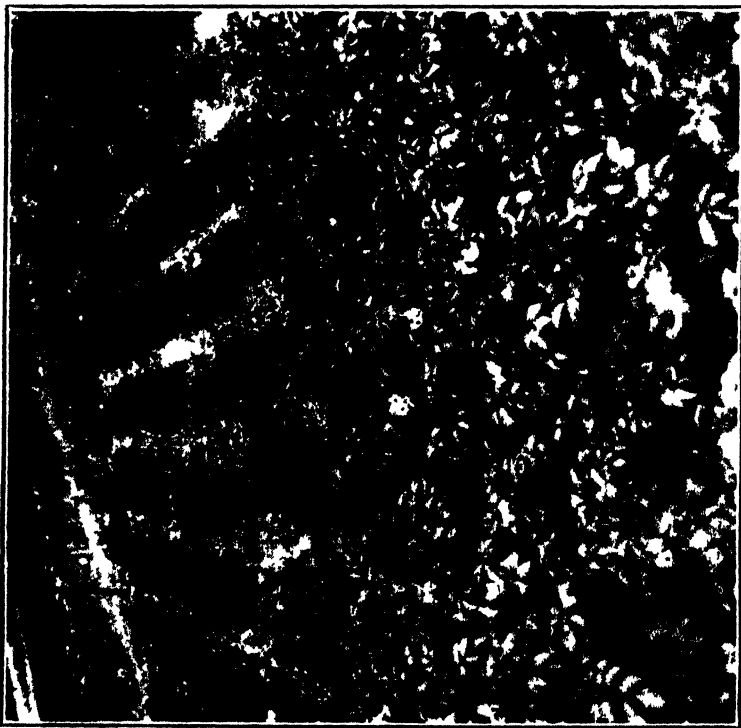


Plot 1 in the foreground Plot 2 in background.



Plot 1 on the left. Plot 2 on the right

Photos A. Blewett



Plot 1 in the background
Plot 2 in the foreground



Photos A Blenkinsop
Plot L to left
Plot R to right

POTATO-SICK SOILS IN DEVON AND CORNWALL

regarded as within the range not likely to be adverse for potato land infested with eelworm. Cysts were plentiful at lifting time, and about equal in number on both plots.

In 1934 potatoes were grown again on Plot 2, and a normal healthy crop was obtained.

In 1934 also, a series of essentially similar trials was conducted on affected plots on the Ilfracombe Municipal Allotments, where the soil conditions were almost identical with those at Newton Abbot. Although the potash was applied late and the subsequent weather was rainless for several weeks on end, the effect was almost as striking as in the experiment described.

Whilst the observations made on the disease in this area, and the results of the experiment over the period quoted, are consistent with the conception of soil balance, it is recognized that in other districts other factors, such as nitrogen, may be involved. The writer, however, believes that the problem is simply a special case of the general argument propounded in the previous article (mentioned above), and that this argument is applicable to many crops other than potatoes. In the light of this explanation the eelworm would be regarded as an accentuating though powerful factor accessory to adverse soil conditions.

The significance of the latter, in the absence of eelworm, is illustrated in the photograph taken in July, 1934, of potatoes growing on two adjacent plots marked "L" and "R." The physical condition of the two soils is identical, but the chemical analyses are totally different: "L" is by far the richer soil, but is toxic to potatoes by reason of a condition of unbalance that is not shown in "R."

	<i>pH</i>	<i>Loss on ignition %</i>	<i>Total phosphoric acid %</i>	<i>Available phosphoric acid %</i>	<i>Exchange able potash %</i>
"L"	6.73	10.21	0.305	0.224	0.046
"R"	6.54	11.04	0.409	0.045	0.048

The poor appearance on "L" is not due to starvation, for actually this plot received much more manure than "R." The two varieties were not the same, but that on "L" was grown on a separate plot similar to "R" and at the time of the photograph was similar in appearance to the crop on "R." The yield of potatoes and the average size corresponded closely with the relative appearance of the tops as shown.

APPLE [SCAB SPRAYING EXPERIMENTS IN THE WISBECH AREA: THE TIMES OF APPLICATION—III*

W. F. CHEAL, D.I.C.,

Horticultural Superintendent, Isle of Ely County Council.

DURING recent years the control of Apple Scab on Bramley's Seedling has become a very important problem as the resistance of this variety to Scab, which formerly existed, appears now to have been entirely lost.

Results have already been published^{1 & 2} showing the value of an additional pre-blossom application of lime-sulphur to other varieties of apple in the Wisbech district; but since the dry conditions of 1933† led some growers to assume that sources of early infection in 1934 would not be so abundant as to warrant an extra application, it seemed desirable to continue the experiments begun in 1931, and to include trees of Bramley's Seedling. It may be remarked that R. W. Marsh, who discovered the value of the "green flower" application for West of England conditions, does not suggest, in his recent summary,³ that this variety requires treatment at this early stage.

(I) Trials with Bramley's Seedling.—Sixteen healthy, three-quarter-standard Bramley's Seedling trees, fourteen years old, about 17 ft. high and of 20 ft. span, growing on mixed rootstocks 36 ft. apart, in cultivated land at the Wisbech Demonstration Plot, were selected and divided into four equal plots of trees.

All the plots were sprayed with a 6 per cent. tar distillate wash in the winter, and in the summer lime-sulphur was applied at 1 in 30, pre-blossom, and 1 in 60, post-blossom, as follows:—

Plot 1.—Two pre-blossom applications, at (i) green flower and (ii) pink bud stages, and two post-blossom applications, at (iii) petal fall and (iv) two or three weeks later.

Plot 2.—Two pre-blossom applications, followed by one post-blossom application at (iii) petal fall.

Plot 3.—Unsprayed.

Plot 4.—One pre-blossom application, at (ii) pink bud, and two post-blossom applications at (iii) petal fall and (iv) two or three weeks later.

* Previous articles appeared in the issues of this JOURNAL for February and December, 1933.

† The latter half of September, 1933, when wood infection might take place, was very wet.

¹ References are given at the end of this article, page 1194.

APPLE SCAB SPRAYING EXPERIMENTS

The dates of application were (i) "green flower," April 23; (ii) "pink bud," May 4; (iii) "petal fall," May 19; (iv) second post-blossom, June 7; and the spray fluids were thoroughly put on by the same operator* with a lance having a medium-sized nozzle supplied from a "Demon" hand-pump. Arsenate of lead was added to the lime-sulphur at the "petal fall" stage.

The blossoming period was somewhat later in 1934 than in 1933, but the rainfall during April and early May was more normal; 2.55 in. were recorded for April, and 0.44 in. for the first fortnight of May.

Scab was observed first on April 22, on the foliage of a neglected tree in the neighbourhood, but although searched for, none was found on other trees until some time later. It was noticed on the unsprayed trees of Plot 3 on May 10, when 20 per cent. of the blossom was open, and at that time very heavy attacks were found on the leaves of Bramley's Seedling in several gardens† in the district.

The climatic conditions which at the outset had been most favourable for Scab completely changed after the "petal fall" stage; hot, dry weather ensued, and very little rain fell from mid-May until July, in which month the total rainfall was 1.57 in., i.e., above the average.

On July 13 the small scabbed leaves that had been infection sources on the unsprayed trees were conspicuously falling, and it was clear that the drought in late May and throughout June had helped check the Scab attack. The rainfall in August was 1.85 in., and the increase of Scab on the fruits during the second half of September was very marked.

The fruit was picked on September 25, and graded into four classes, as in the previous trials: (a) entirely free, (b) "pin spot," (c) "bad" (total Scab spot greater than the size of a threepenny piece and less than that of a shilling), and (d) "bag," with the following results:—

Plot	Scab: Percentage Number of Fruits				Number of Apples	Weight of Crop lb.
	Clean	"Pin Spot"	"Bad"	"Bag"		
1	87.6	10.7	1.5	0.1	1,617	704
2	85.0	11.2	3.0	0.6	1,787	795
3	28.6	33.5	15.3	22.6	1,580	670
4	48.85	32.1	14.0	5.0	1,658	745

* Mr. L. Fisher, who also gave very valuable help in the grading of the fruit.

† In nearly all these the trees had been sprayed only once before blossoming.

APPLE SCAB SPRAYING EXPERIMENTS

Fruits blown down by several severe gales in August were not included in the figures given in the above table.

(II) Continuation of the 1933 Trials with Emneth Early.—A trial similar to that just described was begun in 1933 on trees of Emneth Early, and the same plots were employed and received identical lime-sulphur spray treatments in 1934. These sprays were:—

Plot 1.—Two pre-blossom and two post-blossom applications.

Plot 2.—Two pre-blossom and one post-blossom applications.

Plot 3.—Unsprayed.

Plot 4.—One pre-blossom and two post-blossom applications.

In addition, another four comparable Emneth Early trees, which had been treated like those in Plot 1 in 1933, were used as one-year unsprayed controls in Plot 5.

The trees had been heavily pruned in the winter, and much of the young wood had been removed, except the leaders.

A 6 per cent. tar distillate wash was applied to all the trees in January, and the dates of application of the lime-sulphur sprays, their strengths, and the method of spraying employed, were the same as those already described for Bramley's Seedling.

Scab spots were not observed on the control plots until very late (May 26), and throughout the early part of the season little difference could be seen in the amounts of disease on the various plots.

The trees were picked over for large fruits on July 23, but the final picking was not made before August 25.

The percentage numbers of scabbed fruits in the four grades are given in the following table:—

Plot	Scab: Percentage Number of Fruits				Number of Apples
	Clean	"Pin Spot"	"Bad"	"Bag"	
1	100	—	—	—	2,018
2	99.9	0.1	—	—	3,282
3	38.5	46.3	11.6	3.4	2,374
4	90.6	9.0	0.3	—	2,722
5	52.3	34.2	10.5	2.8	2,352

(III) Trials with Cox's Orange Pippin.—Dillon-Weston and Petherbridge⁴ obtained results near Cambridge in a similar trial in 1932 with Cox's Orange Pippin and Blenheim Orange. They found that the extra pre-blossom application made no difference to the amount of Scab on the foliage of Blenheim Orange, but the wood-

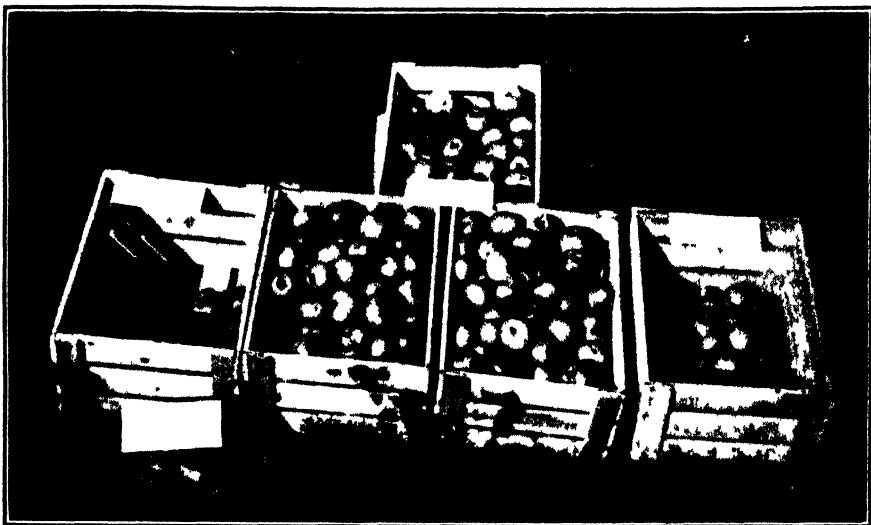


FIG. 1.—Entire crop of fruit from Plot 1, Tree 4. The three centre boxes are filled with the clean fruit. Two apples of the "big" class are in front of the boxes.

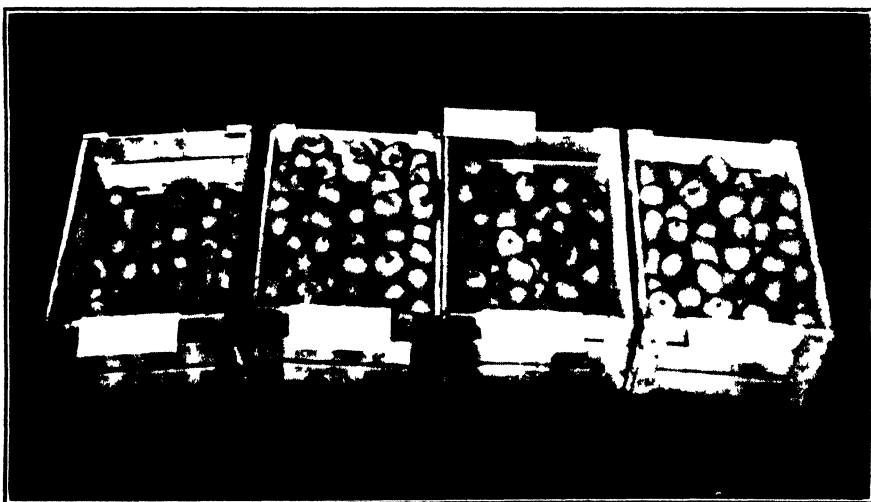


FIG. 2.—Entire crop of fruit from the unsprayed Plot 3, Tree 4. *Photos W. F. Cheal*

APPLE SCAB SPRAYING EXPERIMENTS ON BRAMLEY'S SEEDLING.

APPLE SCAB SPRAYING EXPERIMENTS

susceptible variety Cox's Orange Pippin responded to an additional application at the "green flower" stage. The amount of Scab on the fruit is not recorded in their paper, but the figures obtained from the measurements of Scab spots on the leaves are very striking.

At the Wisbech Demonstration Plot eight trees of fourteen-year-old Cox's Orange Pippin were selected to show the effect on the fruit of a "green flower" application. They were about 17 ft. high and of 13 ft. span, growing in cultivated land, and as they were on alternate rootstocks of Malling Types V and VI, they were divided into two groups each consisting of two trees of each type.

Scab had been troublesome in previous years and the trees had been well sprayed (two pre-blossom and two post-blossom applications). The young lateral wood had been more heavily pruned than is usual for this variety.

The two plots, after a winter application of a 6 per cent. tar distillate wash, were treated with lime-sulphur at 1 in 30 pre-blossom, and 1 in 100 post-blossom, as follows:—

Plot 1—Two pre-blossom (at "green flower" and "pink bud") and two post-blossom ("petal fall" and a fortnight later) applications.

Plot 2—One pre-blossom (at "pink bud") and the same two post-blossom treatments as in Plot 1.

The dates of the applications were "green flower," April 24; "pink bud," May 5; "petal fall," May 23; and second post-blossom, June 7.

Scab spots were seen on May 26, and a slight difference in their occurrence could be detected as the fruit developed.

The apples were gathered on October 6, and graded into the four classes already defined, with the following results:—

Plot	Scab : Percentage Number of Fruits				Number of Apples
	Clean	"Pin Spot"	"Bad"	"Bag"	
1	96.9	2.9	0.1	—	1,278
2	80.7	13.9	4.0	1.4	976

Discussion of Results.—Following a year when Scab was not serious, the spring rains of 1934 were very favourable for its development, and the fungus had obtained a considerable hold on the leaves of Bramley's Seedling by "petal fall." It appeared later and not so severely on Emneth Early and Cox's Orange Pippin.

APPLE SCAB SPRAYING EXPERIMENTS

A very dry period followed "petal fall," and continued until the beginning of July. This arrested the progress of the disease on all three varieties and prevented the season from becoming a particularly bad one for Scab. Infections were, however, revived by rainfall in July and August.

The figures obtained for Bramley's Seedling indicated that spraying at the "green flower" stage was exceedingly valuable in the Wisbech district in 1934. The increased percentage of clean apples obtained in Plots 1 and 2 compared with Plot 4 (over 35 per cent.) more than repaid the cost of the spray. The high percentage of "bad" and "bag" apples on the unsprayed plot (38 per cent.) shows that Bramley's Seedling is by no means resistant to Scab.

With Emneth Early, although the difference between the two pre-blossom Plots 1 and 2 and the one pre-blossom Plot 4 tends to confirm the conclusion drawn from the 1933 trial that spraying at the "green flower" stage is wise, yet the difference is a small one when the large amount of Scab on the one-year unsprayed Plot 5 is taken into account. The "green flower" application does not seem to be so important with Emneth Early as with some other varieties, e.g., Worcester Pearmain, Bramley's Seedling and Cox's Orange Pippin, in the Wisbech area.

The results with Cox's Orange Pippin definitely show that spraying at the "green flower" stage is advisable at Wisbech, even if the young lateral wood has been heavily pruned away and the trees have been well sprayed in the previous year. In the 1932 trials carried out by the Cambridge workers already referred to, the trees had not been previously sprayed, and the season was much more favourable to Scab attack.

REFERENCES.

¹ This JOURNAL, February, 1933.

² *Ibid.*, December, 1933.

³ Annual Report of the Research Station, Long Ashton, 1933. Pp. 88-95: "A Summary of Recent Investigations on Apple Scab."

⁴ *Jour. Pom. and Hort. Sci.*, Vol. XI, No. 3: "Apple and Pear Scab in East Anglia."

**CONTROL OF THE COMMON GREEN
CAPSID BUG:
WITH SPECIAL REFERENCE TO THE USE OF
TAR-PETROLEUM OIL WINTER WASHES**

M. D. AUSTIN, S. G. JARY and H. MARTIN,
South-Eastern Agricultural College, Wye, Kent.

THE Common Green Capsid Bug (*Lygus pabulinus* Linn.) has for many years been recognized as a serious pest of bush fruits, especially red and black currants, and the true Apple Capsid Bug (*Plesiocoris rugicollis*) occurs with the former species at times and causes much the same type of injury. The Common Green Capsid has been described and its life history worked out by Petherbridge and Thorpe,¹ and a wide range of host plants has been recorded by many workers in this country. Among cultivated plants it has been proved to feed upon currants, gooseberries, blackberries, apples, pears, hops, strawberries and many other crops, while in the summer it commonly occurs upon a great variety of weeds, such as thistles, nettles and bindweed.

The bug causes injury that is too well known to need further description, and its control in commercial plantations has become a matter of some importance, especially in recent years when it has become clear that the growth of bushes may be seriously interfered with owing to the insects feeding upon the growing tips.

Review of Control Measures.—It was natural that the recognized contact poison insecticides normally used against soft-bodied insects should be tested against this capsid. Such washes are employed in the spring in order to destroy the bugs after they have hatched, and nicotine has been widely used for this purpose.

Petherbridge and Thorpe¹ advised the use of a wash containing 8 fluid ounces of nicotine (98 per cent. purity) in 100 gal. of water, together with 8-10 lb. of soft soap or other suitable spreader. They found that the immature bugs readily dropped to the ground before they were touched with the wash, and that the best control was obtained by shaking the bushes and then spraying the ground beneath.

Austin² employed both nicotine dusts and washes during

¹ For references, see page 1205.

CONTROL OF THE COMMON GREEN CAPSID BUG

the latter half of May. Dusts containing 3 per cent. of nicotine were applied at the rate of about 30 lb. per acre, and dusting was commenced at the base of the bush, the soil in some instances being dusted as well. Counts of the capsids made afterwards showed that the younger individuals (Instars 1 and 2) succumbed much more readily than older ones (Instar 3), a mortality of about 80 per cent. occurring with the former and about 60 per cent. with the latter. Instar 4 showed a mortality of only about 20 per cent. An estimation of the degree of control obtained, made a week after dusting, showed 15-30 per cent. of freshly-marked shoots on the untreated bushes, and 5-10 per cent. on the dusted bushes. Bushes that had received two dustings were only slightly better than those dusted once, and it appeared that the use of these dusts did not offer much hope of obtaining a commercial control. A nicotine wash composed of 3 fluid ounces nicotine, 4 lb. soft soap and 40 gal. of water gave results very similar to those obtained by the dusts, but the immature bugs were rather more readily killed by washes. An enhanced control was obtained when the ground beneath the bushes was sprayed.

With the advent of ovicidal washes, trials were made to test their effect upon the eggs of the Common Green Capsid Bug as well as the eggs of many other insects. Theobald³ stated that 6 per cent. strength of several commercial brands of tar oil winter washes was of no value in controlling the capsid on black currants, and Austin² arrived at the same conclusion but indicated that at 10 per cent. strength these washes brought about a very slight reduction in attack.

In the course of experiments with the Long Ashton tar oil wash, Staniland and Walton⁴ conducted trials on black currants containing eggs of both the Apple Capsid Bug and the Common Green Capsid Bug. When the wash was applied at 10 per cent. strength, infestation was materially reduced, for whereas untreated bushes showed 70 per cent. of marked shoots, those that had received the wash had only 20 per cent. of shoots affected. They stated, however, that the degree of control obtained was not of the same high order as that obtained with the Apple Capsid Bug alone, on apples. In subsequent experiments Staniland, Tutin and Walton⁵ confirmed these results, and further showed that the Long Ashton two-solution wash gave better control than the modified Long Ashton wash, while a commercial "standard" tar oil wash was practically ineffective. All

CONTROL OF THE COMMON GREEN CAPSID BUG

these washes were applied at the same concentration, 10 per cent.

Just before 1930, there were introduced a number of commercial washes in which petroleum (mineral) oils were used, and it was found that these petroleum oil washes gave a better control of the eggs of capsid bugs than the tar oil washes. Staniland, Tutin and Walton⁶ carried out experiments against capsid bugs on black currants with a wash containing equal parts of a Long Ashton tar oil and a heavy paraffin oil (Shell P₂), and obtained a very high degree of control. This wash at 10 per cent. concentration was for all practical purposes completely successful in killing the eggs, whereas the tar oil alone at 10 per cent. concentration reduced attacks to about 10 per cent. of shoots marked, the untreated bushes showing 30 per cent. of marked shoots.

Staniland and Walton⁷ further showed that a rather cheaper and less highly refined petroleum oil (Shell No. 1301) gave results comparable with those obtained with the highly refined oil (P₂), when the oils were used at 5 per cent. concentration, and that the toxicity of each of these oils was enhanced by the addition of 5 per cent. of a tar oil, such a wash giving complete control. When the proportions of the two oils were varied, results were not so satisfactory, and the 50-50 mixture was regarded as the best combination. These workers tested the new wash against the original Long Ashton tar oil wash, and expressed their opinion that the tar oil wash alone could no longer be regarded as satisfactory for the control of the Common Green Capsid Bug on currants.

It should be noted that, in all the experiments carried out at Long Ashton, the washes used were of the two-solution type, using Agral WB as the emulsifier; and to bring about emulsification, the requisite quantity of caustic soda had to be added. The specifications of the oils used in the experiments were known.

Meanwhile, Petherbridge and Hey⁸ used two proprietary mineral oil emulsions, A and B, and compared these with the Long Ashton tar oil wash against the Capsid Bug on red currants. The Long Ashton tar oil wash at 10 per cent. brought about a slight reduction in attack, while both the mineral oil emulsions at $7\frac{1}{2}$ per cent. were much more satisfactory. Mineral oil emulsion B was superior to mineral oil emulsion A and reduced the infestation to very small proportions.

General Conclusions from Experiments up to 1931.—

From the brief review given above, it seems clear that nicotine dusts and washes cannot be advised for the control of the Common Green Capsid Bug, and that commercial brands of tar oil washes even at 10 per cent. concentration are also unsatisfactory. Tar oil washes of the Long Ashton type may be expected to give some degree of control, but they are of doubtful value commercially against this insect. Petroleum oil washes made from highly refined (white) oils and also from rather less highly refined (half white) oils give a high degree of control by themselves at a concentration of 5 per cent. and when incorporated with an equal quantity of Long Ashton tar oil, to make a wash of 10 per cent. total oil concentration, a complete control of the Capsid Bug can be obtained. The inclusion of tar oil in

CONTROL OF THE COMMON GREEN CAPSID BUG

the wash, in addition to giving added toxicity towards the eggs of the Capsid Bug, also ensures the destruction of aphid eggs on the bushes. Proprietary mineral oil emulsions are variable in their toxicity towards the eggs of the Capsid.

Experimental Work subsequent to 1931.—From 1931 onward to the present time, the authors, in the course of investigating the ovicidal properties of various tar and petroleum oils, have used the eggs of the Common Green Capsid Bug for test purposes. Tar oils of cheaper grades than those used in the preparation of Long Ashton tar oil washes, and a wide range of petroleum oils, including many relatively cheap semi-refined oils, have been tested. This work is fully described elsewhere by Austin, Jary and Martin,^{9, 10, 11} and from these experiments it has been possible to draw further conclusions as to what types of oil are suitable for the preparation of a winter wash for the control of the Capsid Bug on currants. Briefly these conclusions are:—

(a) Certain relatively cheap semi-refined petroleum oils are as toxic to the eggs of the Capsid Bug as are the highly refined and more expensive petroleum oils.

(b) Semi-refined oils, within certain wide limits, are all of equal toxicity toward these eggs.

(c) A concentration of 6 per cent. of a suitable petroleum oil in a wash will give complete commercial control, even where infestations are very severe: a concentration of 4.5 per cent. of such an oil will give a very high degree of control.

(d) The addition of 3 per cent. of a suitable tar oil ensures the destruction of aphid eggs and also enhances the ovicidal properties of the wash with regard to capsid eggs.

For the purpose of testing numerous oils, and also to enable washes of varying concentrations to be made up in the field, it was necessary to elaborate a quick and easy method of preparing the emulsions, and one was finally worked out that permits the grower, if he so desires, to emulsify the tar and petroleum oils, or a combination of both, without difficulty.

As one outcome of this work, it is now possible to recommend a wash of definite composition suitable for the control of the Common Green Capsid Bug on currants. This wash, which is considerably cheaper than washes previously suggested, has been used successfully on a commercial scale during the past three years by a number of Kentish fruit growers.

Field Experiments and Demonstrations.—We are greatly indebted to Messrs. A. Amos, Wye; J. H. Berry, Selling; P. T. S. Brook, Sturry; J. F. Foat, Ash; E.

CONTROL OF THE COMMON GREEN CAPSID BUG

Gaskain, Dargate; and T. Neame, Macknade, for the facilities they have provided for carrying out experimental work in their plantations in the period 1931-1934. In some instances large-scale experimental plots have been laid out, and in others large acreages of currants have been washed as a commercial demonstration. As part of the demonstration, it was decided to see whether the selected wash could successfully be made by the grower in the field and whether he could expect to be able to purchase the ingredients necessary to prepare the wash from oil companies and tar distillers. He was accordingly given the specifications set out below, and obtained quotations for the required quantities of oils, which were delivered direct to him. At the commencement of washing, at each centre, one demonstration was given of the method of making the emulsion, that is, the first 40-gal. or 100-gal. lot was prepared by us, and he was then left to prepare it as required.

Application of the Wash.—In all the years from 1931-1934, the washes have been applied to red and black currants during the second and third weeks in February. The spraying machinery has varied from small knapsack machines to power units working at up to 350 lb. pressure, and there is no evidence that the efficacy of the wash is related to the pressure at which it is applied provided that the bushes are adequately covered. Knapsack machines have given results as good as those obtained in any other way; and, in laboratory tests, twigs containing eggs were simply immersed in a glass cylinder containing the wash. The wash itself possesses very great wetting power, but care must be taken to cover the undersides of branches, and all shoots to the tips.

The amount of wash required naturally depends upon a variety of conditions, such as the size of bushes and the distance of planting, but some indication may be obtained from the following data. Black currant bushes of the variety Baldwin 3 ft. 6 in. to 4 ft. high, planted 6 ft. square, washed with a machine working at 350 lb. pressure, operating 5 lances, required about 300 gal. per acre, and rather smaller red currants planted 5 ft. square took about the same quantity of wash.

Injury to Bushes.—In the great majority of cases, black currants used in the experiments have been of the variety Baldwin, but other varieties have been employed. Red currants have been largely Fay's Prolific, and in one instance a large block of Laxton's No. 1. After the middle of February, in most seasons, bushes are normally beginning to show signs of bud development, and this has been

CONTROL OF THE COMMON GREEN CAPSID BUG

general during the period under review; indeed, in some instances definite green tips have been showing out of the buds when the wash has been applied. Until 1934 no sign of injury had been recorded by us, though occasionally the development of leaves appeared to have been slightly retarded, but any effect of this kind disappeared very quickly.

Other workers have recorded the apparent killing of a few buds by high concentrations of tar oil washes alone. At two centres where Fay's Prolific was washed in 1934, the bushes came into leaf in somewhat irregular fashion and the effect known as "running off" of the blossoms was widespread. It was definitely more pronounced on bushes washed with the tar-petroleum oil mixture than on adjacent bushes of the same variety that had received a proprietary tar oil wash, though it did occur on the latter. In the area in question, a frost of 11° F. was experienced in early April, just as the flower trusses were showing, and there is little doubt that the injury was due to frost, accentuated by the slight retardation of foliage development caused by the wash. This effect had not been observed in the three previous seasons, and in 1934 adjacent bushes of Laxton's No. 1 were unaffected and carried a very large crop. Fay's Prolific is the only variety on which the "running off" effect has been seen. In no instance have black currants shown any sign of injury.

Apart from the instance described, washed bushes have always carried a crop equal to the seasonal average in the district, and have been outstanding by reason of the healthy wood growth made. In one case, a field of the variety Baldwin was about to be grubbed because no new wood growth could be obtained. These bushes were completely freed from infestation by one application of the wash, and in the following summer made excellent growth.

Degree of Control of Capsid Bug.—The results in the field have been comparable with those obtained in the laboratory, practically complete freedom from capsid infestation having been regularly obtained. On untreated bushes, the percentage of infested shoots has ranged from 50 per cent. up to almost 100 per cent., whereas adjacent washed bushes have had less than 2 per cent. shoots attacked. These results have been obtained under ordinary commercial conditions as well as in experiments, and the wash made up by the grower has proved as satisfactory as that made by us. Indeed, where large acreages have been washed as part of the routine work, it has sometimes been difficult to find a single bush showing capsid markings.

General Recommendations.—Using a wash composed of the tar and petroleum oils described below and the two-solution method of emulsification with oleic acid and caustic soda, the following recommendations can be made:—

(1) Where attacks by the Common Green Capsid Bug are very severe on red and black currants, the wash should be applied about the middle of February at a total oil con-

CONTROL OF THE COMMON GREEN CAPSID BUG

centration of 9 per cent., that is, 3 per cent. strained anthracene oil referred to below as Grade A tar oil and 6 per cent. petroleum oil referred to below as Grade E petroleum oil.

(2) Where infestations are not so severe, or where the 9 per cent. wash has been used in the previous year, a wash containing 7.5 per cent. total oil concentration will give a commercial control. This wash should consist of 3 per cent. of the tar oil and 4.5 per cent. of the petroleum oil.

(3) Gooseberries and cultivated blackberries, in which the eggs of the capsid are frequently laid, have not been subjected to critical test for wash injury, but judging from small-scale experiments, it seems that they are more susceptible to injury than currants and should be washed earlier if the higher oil concentration is used. The petroleum oil alone at 6 per cent. concentration appears to cause little or no injury when applied in February.

Preparation of the Wash.—INGREDIENTS REQUIRED.—

Petroleum Oil.—Laboratory and field tests have shown that over a wide range of physical and chemical properties the petroleum oils are equally effective in controlling the Common Green Capsid Bug. The main requirements of a suitable petroleum oil* are:—

(1) A high boiling range, but not so high that the viscosity of the oil makes it troublesome to measure;

(2) A high content of saturated hydrocarbons, though it has been found that the unsulphonated residue, a figure which gives an indication of the content of saturated hydrocarbons, may fall as low as 60 per cent. without loss of efficiency.

The oil refiner should therefore be asked to supply the cheapest oil that satisfies the following requirements:—

(a) Specific Gravity (60° F.); 0.86—0.92.

(b) Viscosity: Between 125" and 500" Redwood 1 @ 70° F.

(c) Boiling Range: At least 90 per cent. by volume to distil above 315° C., at least 50 per cent. above 350° C., and at least 20 per cent. above 380° C.

(d) Unsulphonated residue: Not less than 60 per cent. by volume.

Items (a) and (b) should be determined by the standard methods of the Institute of Petroleum Technologists; item (c) by the method suggested for the tar oil; and item (d) should be estimated by the method given by Martin (1931).

For ease of reference, a petroleum oil fulfilling the requirements of the above specification is called a Grade E oil. The grower can then purchase the oil simply as a Grade E oil and he need not be concerned with an elaborate and technical description. It has, however, been necessary to give the full specification so that the refiner from whom it is purchased can supply an oil of the required character.

Tar Oil.—Tar oil is incorporated mainly to ensure the destruction of aphid eggs, and oils suitable for this purpose

* A full discussion of the specifications of the tar-distillate and mineral oils will be published in *Annals of Applied Biology* during the current year (1935).

CONTROL OF THE COMMON GREEN CAPSID BUG

are completely soluble in methyl sulphate. The tar oil has also been shown to contribute to the toxicity of the wash toward capsid eggs, for which purpose it is advantageous to have a high-boiling tar oil with a high content of neutral oils.

Such high-boiling tar oils belong to the anthracene oil class and they are the source of anthracene, a solid hydrocarbon which separates from these oils on cooling. It has been shown not only that the solid hydrocarbons are useless for ovidical purposes but that they are objectionable in the spray, since they increase risk of damage and are likely to interfere during spray application. The tar oil used should therefore be so treated by the distiller that it is unlikely to deposit solid anthracenoid hydrocarbons on storage. Finally, as the method of preparation of the wash involves the addition of oleic acid to the oil, the latter should be free from alkali which, if present, would react with the oleic acid, giving a solid soap difficult to dissolve in cold water. The tar oil should therefore satisfy the following requirements:—

- (a) Content of neutral oils to be not less than 88 per cent. by weight.
- (b) The neutral oils should have a specific gravity (60° F.) of between 1.09 and 1.11.
- (c) At least 90 per cent. by volume of the neutral oils should distil above 270° C., at least 50 per cent. above 325° C. and at least 20 per cent. above 365° C.
- (d) The neutral oils should be completely soluble in methyl sulphate.
- (e) The tar oil should not contain more than 5 per cent. by weight of solid matter.
- (f) The tar oil should be free from alkali.

The content of neutral oils and their solubility in methyl sulphate should be determined by the method prescribed by Martin (1931) and Austin, Jary and Martin (1932); their specific gravity and boiling range by methods proposed by the Standardization of Tar Products Test Committee for "Heavy Creosote Oil." A tar oil fulfilling the above specification is for convenience referred to as a Grade A tar oil.

Oleic Acid.—In ordinary circumstances the oils may be emulsified by a two-solution method that involves the use of oleic acid and caustic soda. A suitable oleic acid is the grade known as Brown Oleine, and it should fulfil the following specification:—

- (a) Acidity, 95-100 per cent. as oleic acid.
- (b) Clearing point, 9-12° C.

The first requirement ensures the presence of a high proportion of fatty acid whilst the clearing point ensures that the requisite proportion of the solid fatty acids have been removed. An oleic acid of this specification will be liquid, but if exposed to frost it may become a paste that will, however, mix quite readily with the tar and petroleum oils.

Caustic Soda.—A convenient form in which to purchase the caustic soda is as flake of 98-99 per cent. purity packed in 1-lb. lever-lid tins. If handled carelessly, caustic soda may cause nasty burns, but when packed in this manner the dangers of handling and the necessity for weighing are reduced to a minimum.

CONTROL OF THE COMMON GREEN CAPSID BUG

MIXING THE WASH.—For convenience the quantities here mentioned are the amounts required to make 100 gal. of wash :—

Three gal. of Grade A tar oil, 6 gal. of Grade E petroleum oil and 1 gal. of oleic acid are thoroughly mixed in a suitable container. Into a separate 100-gal. tank water should be started running, 1½ lb. caustic soda should be added, and the volume should be made up to 90 gal. with water. Then, while the whole is stirred, 10 gal. of oil-oleic acid mixture should be gently poured in. The oil should at once emulsify, producing a creamy-yellow frothing liquid that is ready for application.

If the tanks available are such that it is easier to prepare 40 gal. of wash, about ½ lb. caustic soda may be stirred into 36 gal. of water, and a mixture composed of 10 pints tar oil, 19 pints petroleum oil and 3 pints oleic acid may be added.

The prepared wash should be used at once, because with some types of water it is apt to cream. The oil-oleic acid mixture will, however, keep indefinitely, and, if it is convenient, the oils and oleic acid may be mixed in the proportion of 3 Grade A oil, 6 Grade E oil and 1 of oleic acid; 10 gal. of this mixture can then be measured out and added to 90 gal. of water containing 1½ lb. caustic soda for the preparation of a wash of 9 per cent. oil concentration, which is the maximum strength necessary.

ALTERNATIVE METHODS OF PREPARATION.—The two-solution oleic acid method of emulsification is satisfactory for all but the hardest dyke waters, and if it is necessary to use such water for the preparation of a wash the Bordeaux Mixture method of emulsification may be employed. This method takes advantage of the ability of freshly-prepared Bordeaux Mixture to act as an emulsifier. A suitable strength of Bordeaux Mixture to use is the 4:6:100 mixture, employing 4 lb. bluestone, 6 lb. hydrated lime and 100 gal. water. It is convenient first to prepare a stock copper sulphate solution by dissolving bluestone in the proportion of 1 lb. bluestone to 1 gal. of water. Then for the preparation of 100 gal. of wash one may proceed as follows: Stir 6 lb. hydrated lime to a smooth paste with water and dilute this paste with more water to make 87 gal. To this suspension add 4 gal. of the stock bluestone solution and immediately after add the 9 gal. of oil mixture, which is composed of 3 gal. of Grade A tar oil and 6 gal. of Grade E petroleum oil.

N.B.—Oleic acid and caustic soda are not required for this method of emulsification.

Emulsification of the oil does not proceed automatically as with the oleic acid emulsion, but it is necessary to use the pumps of the sprayer to complete the process. Keeping the contents of the tank stirred, the pumps may be started and the liquid allowed to pass through the pumps and back into the tank through an open hose or through the return flow alone. The passage of the liquid through

CONTROL OF THE COMMON GREEN CAPSID BUG

the pumps brings about the formation of a thick yellowish green emulsion; this is complete in a few minutes and the wash may then be applied.

The methods of emulsification described above, especially the oleic acid method, are simple and foolproof in so far that, if owing to some mistake or other reason the emulsification does not proceed correctly, it is at once evident from the appearance of the liquid, and the wash should then on no account be applied to trees.

Some growers may naturally prefer to use a manufactured product, since all have not the facilities or inclination to mix their own washes in the way described. A further objection is sometimes made that the purchase of ingredients may necessitate dealing with four separate firms and the quantities required are too small to warrant the trouble. It should be remembered, however, that each of the ingredients may serve a useful purpose other than as a wash for currants. Thus the oils may be used in other proportions as winter washes for other crops, such as apples, and the petroleum and tar oils can be made separately into emulsions for any particular purpose, such as the preparation of a tar oil wash alone for application to plums. The oleic acid and caustic soda can also be used for the preparation of soap by the cold-water method.¹³

The fact that in all trials emulsions prepared either by the oleic acid or Bordeaux mixture methods have given similar results, indicates that the method of emulsification and the emulsifier present have a negligible effect upon the ovicidal properties of the oils. It should therefore be possible for manufacturers to produce tar-petroleum oil preparations, to which the addition of water alone is required, to give washes that will control the Common Green Capsid Bug effectively on currants. For this purpose the products should be such that the washes produced contain tar and petroleum oils similar in amount and quantity to those of the home-made washes described above.

Summary.—Experimental work that has been carried out on the control of the Common Green Capsid Bug, especially that concerned with the development of suitable ovicidal washes, is reviewed above.

This work shows that certain tar-petroleum oil washes are highly toxic to the eggs of the Capsid Bug, and that such washes may safely be applied to red and black currants up to the middle of February.

Directions are given for the preparation of a suitable tar-petroleum oil wash and the results of trials and demonstrations carried out in Kent with this wash are described.

The wash is prepared from tar oils conforming to the specification given below for Grade A oils and from petroleum oils conforming to the specification given below for Grade E oils, by means of a two-solution method employing oleic acid and caustic soda as emulsifiers.

An alternative method of emulsification is given for use with types of water for which the two-solution oleic acid method is unsuitable.

CONTROL OF THE COMMON GREEN CAPSID BUG

TABLE OF SPECIFICATIONS.

	Grade A.	Grade E.
(a) Neutral oils, % by weight not less than ..	68.0	100
(b) Solid matter, % by weight not more than	5.0	—
(c) Tar acids, % by weight not more than ..	—	—
(d) Alkali	Nil	Nil
Neutral oils:		
(e) Sp. Gr. (60° F.)	1.09-1.11	0.86-0.92
(f) Viscosity, Redwood 1 at 70° F.	—	125"-500"
(g) Boiling range:		
90 % by vol. to distil above	270° C.	315° C.
50 % by vol. to distil above	325° C.	350° C.
20 % by vol. to distil above	365° C.	380° C.
(h) Methyl sulphate, % by vol. insol. ..	Nil	—
(i) Unsulphonated residue, % by vol. not less than	—	60

Items (e) and (f) determined by the standard methods of the Institution of Petroleum Technologists.

Item (g) determined by the method recommended by the Standardization of Tar Products Tests Committee for "Heavy Creosote Oils."

Items (a), (c) and (i) determined by the methods given by Martin.¹²

Item (h) determined by the method suggested by Austin, Jary and Martin.⁹

REFERENCES.

- ¹ Petherbridge and Thorpe: The Common Green Capsid Bug, *Lygus pabulinus*. *Ann. Appl. Biol.*, Vol. 15, No. 3, Aug., 1928.
- ² Austin: Field Experiments on the control of the Apple Capsid, *Plesiocoris rugicollis* Fall. and the Common Green Capsid, *Lygus pabulinus* Linn. during 1929. *Jour. South Eastern Agric. Coll.*, No. 27, July, 1930.
- ³ Theobald: Tar Distillate Trials in Kent and W. Sussex in 1928. *Jour. Pom. and Hort. Sci.*, Vol. 7, No. 3.
- ⁴ Staniland and Walton: The Long Ashton Tar Distillate Wash: Field Experiments, 1929. *Jour. Min. Agric.*, Vol. 36, Sept., 1929.
- ⁵ Staniland, Tutin and Walton: Investigations on Egg-Killing Washes at the Long Ashton Research Station. *Jour. Pom. and Hort. Sci.*, Vol. 8, No. 2.
- ⁶ Staniland, Tutin and Walton: The Control of Capsid Bugs on Black Currants. *Jour. Min. Agric.*, Vol. 37, Aug., 1930.
- ⁷ Staniland and Walton: The Control of Capsid Bugs on Black Currants. Field Experiments in 1931. *Ann. Report of the Long Ashton Research Station*, 1931.
- ⁸ Petherbridge and Hey: The Control of the Common Green Capsid Bug on Red Currants. *Jour. Min. Agric.*, Vol. 37, Mar., 1931.
- ⁹ Austin, Jary and Martin: Studies on the Ovicidal Action of Winter Washes, 1931 Trials. *Jour. South Eastern Agric. Coll.*, No. 30, July, 1932.
- ¹⁰ Austin, Jary and Martin: Studies on the Ovicidal Action of Winter Washes, 1932 Trials. *Jour. South Eastern Agric. Coll.*, No. 32, July, 1933.
- ¹¹ Austin, Jary and Martin: Studies on the Ovicidal Action of Winter Washes, 1933 Trials. *Jour. South Eastern Agric. Coll.*, No. 34, July, 1934.
- ¹² Martin: The Examination of Tar and Mineral Oil Insecticides. *Jour. Soc. Chem. Ind.*, L. 91T-94T.
- ¹³ Martin: The Present Uses and Future Development of Spray Spreaders. *H.E.A. Year Book*, Vol. 1, 1932.

MARKETING NOTES

Milk Marketing Scheme: Regional Pool Prices for January.—The wholesale contract price for January was the same in all regions as for December, namely 1s. 5d. per gal. Pool prices and rates of producer-retailers' contributions for the three months November, 1934, to January, 1935, are given below:—

<i>Region</i>	<i>Pool Price</i> (d. per gal.)			<i>Producer-Retailers'</i> <i>Contributions</i> (d. per gal.)		
	Nov.	Dec.	Jan.	Nov.	Dec.	Jan.
Northern ..	14	14½	14½	1½	2½ ⁷ / ₈	2½
North-Western	14	14½	14½	1	2½ ⁷ / ₈	2½
Eastern ..	14½	14½	14½	1½	2	2
East Midland	14	14½	14½	1	2½	
West Midland	13	14	14	2½	2½	
North Wales	13½	14	14½	2½ ⁵ / ₈	2½ ⁵ / ₈	2½ ⁷ / ₈
South Wales	14	14½	14½	1½	2½	2½ ¹ / ₈
Southern	14½	14½	14½	1½	2½ ¹ / ₈	2½
Mid-Western	13	14½	14	2½	2½ ⁷ / ₈	2½ ⁵ / ₈
Far-Western	13	14	14	2½	2½ ⁵ / ₈	2½ ⁵ / ₈
South-Eastern	14½	14½	15½	1½	2½ ⁷ / ₈	1½ ¹ / ₈
Unweighted Average	13.80	14.34	14.45	1.85	2.37	2.28

Producer-retailers who did not sell milk by wholesale during the month otherwise than on contracts carrying level delivery premiums were credited with a level delivery premium of ½d. a gal. The Board's levy for expenses, liabilities and reserves remained at ¼d., as in the previous month.

The estimated sales under contract for January were 65,200,718 gal., an increase of 2,289,092 gal. over December sales. Liquid sales (46,680,384 gal.) showed an increase of 1,521,906 gal. and manufacturing sales (18,520,334 gal.) an increase of 767,186 gal. compared with December. The proportion sold for manufacture constituted 28.4 per cent. of total sales, compared with 28.2 per cent. in December. The average realization price of manufacturing milk was 6.31d. per gal.

Milk manufactured into cheese by farmhouse cheese-makers declined from 252,209 gal. in December to 215,739 gal. in January.

Pigs and Bacon Marketing Schemes.—*Price of Bacon Pigs for February.*—The price of the "basic" pig (Class I, Grade C) for February was 11s. 5d. per score, compared with 11s. 3d. for January.

Contract Arrangements for 1935.—The Pigs Marketing

MARKETING NOTES

Board announced on Feb. 5 that the total number of pigs for delivery during 1935 for which contracts had been entered into by registered producers was 1,799,687, of which 1,541,301 were on direct contracts, 146,712 on group contracts and 111,674 on supplementary contracts. The number of pigs contracted to be delivered in the last eight months of the year is practically the same as in the corresponding period of 1934 notwithstanding the increase in the pig population, and in order to augment the supply of pigs in this period the Pigs Marketing Board have prescribed a further supplementary contract for the delivery of pigs in the months May to December. The contract provides for the sale of pigs to the Board, and its terms are identical with those of the previous supplementary contract referred to in this JOURNAL for December, 1934. The Board are prepared to register contracts in the prescribed form received up to April 15 next.

Transport of Pigs: Flat Rate Arrangements.—The various forms of contract prescribed by the Pigs Marketing Board for 1935 require the curer to enter into an agreement with the Railway Companies to the effect that all live pigs bought by him shall be transported by the Companies on the flat rate terms agreed between the Companies and the Pigs and Bacon Boards. In consequence of representations made to the Bacon Board as to the effect of this requirement on the trade of curers who buy pigs also for pork, an agreement has been reached between the Companies and the Boards under which porkers may, in certain cases, be exempted from the conditions of the flat rate agreement. A committee consisting of representatives of the Companies and the Boards has been set up to consider applications for exemption.

Repayment of Loans from Agricultural Marketing Funds.—Loans of £5,000 and £4,300 made to the Pigs Marketing Board for initial poll expenses and for the initial working expenses of the Scheme respectively were repaid with interest on Dec. 31, 1934. The loan of £160,000 made to the Bacon Marketing Board for payment of compensation to curers in respect of losses due to the operation of the Schemes during the first contract period was repaid in full with interest by the due date, Jan. 30, 1935.

Potato Marketing Schemes.—At a special meeting held on Jan. 29, the Potato Marketing Board decided upon new

MARKETING NOTES

minimum riddle sizes applicable in February in respect of the following areas and varieties:—

For *King Edwards*, *Red King* and *Dunbar Cavalier* produced in Scotland, Norfolk, Lincolnshire, Isle of Ely and Soke of Peterborough, the minimum riddle size was raised from $1\frac{1}{8}$ in. to $1\frac{1}{4}$ in. (This does not apply to limestone potatoes.)

For all white varieties produced in Scotland, with the exception of *Dunbar Red Souls*, the minimum was raised from $1\frac{1}{8}$ in. to $1\frac{1}{4}$ in.

The operation of the riddle regulations made on Dec. 6, 1934, and noted in this JOURNAL for January, has been continued until further notice, subject to the temporary alterations specified above.

Census of Potato Stocks.—All registered producers and authorized merchants have been requested to furnish the Board with returns showing by varieties the stocks of potatoes of marketable quality remaining on farms on the night of Feb. 16, and the quantities sold off farms up to that date.

Milk Reorganization Commission for Great Britain.—The Secretary of State for Scotland and the Minister of Agriculture and Fisheries have appointed an Agricultural Marketing Reorganization Commission for Great Britain, with the following terms of reference:—

1. To consider the working of organized milk marketing in Great Britain under Milk Marketing Schemes and its incidence on production, distribution and consumption, and to make recommendations for further improvement.

2. To consider and report on the extent to which and the manner in which organization could be facilitated by closer co-operation between the Marketing Boards concerned, or by the amalgamation of some or all of the schemes, including any schemes at present under consideration, or by other adjustments, and to prepare schemes for giving effect to any such adjustments.

3. To consider and report on the extent to which, and the manner in which, the organization of milk marketing in Great Britain could be facilitated by closer co-operation between Milk Marketing Boards in Great Britain and the appropriate authorities in Northern Ireland.

The Government of Northern Ireland have been consulted with regard to the terms of reference and have intimated their willingness to afford every assistance to the Commission in the solution of their problems.

The composition of the Commission is:—

A. E. Cutforth, Esq., C.B.E. (Chairman).

Professor A. W. Ashby, M.A.

Sir Iain Colquhoun, Bart., D.S.O.

Sir John Orr, D.S.O., M.C., M.A., M.D., D.Sc., F.R.S.

Miss D. S. Tomkinson, M.A., J.P.

The Secretary of the Commission is Mr. H. J. Johns, M.B.E., of the Ministry of Agriculture and Fisheries, and the Assistant Secretaries, Mr. F. H. Keenlyside, of the Ministry of Agriculture and Fisheries, and Mr. J. C.

MARKETING NOTES

Russell, of the Department of Agriculture for Scotland. Communications for the Commission should be addressed to the Secretary at 3, Sanctuary Buildings, Great Smith Street, London, S.W.1.

Reorganization of the Poultry Industry: Report of the Blundell Commission.—The Report of the Reorganization Commission for Eggs and Poultry for England and Wales* has been issued by the Ministry of Agriculture and Fisheries as one of the series of Orange Books on Agricultural Marketing.

The Commission was appointed on Oct. 9, 1933, under the Chairmanship of the Rt. Hon. Christopher Addison, M.D., to prepare, in accordance with the Agricultural Marketing Acts, 1931 and 1933, a scheme or schemes, applicable in England and Wales, for regulating the marketing of eggs and poultry. Dr. Addison resigned his position as Chairman on the 10th October, 1934, after evidence had been taken and basic principles formulated, and Mr. F. N. Blundell, who had been a Member of the Commission, was appointed as his successor on Nov. 1, 1934.

The marketing problems of eggs and of poultry are discussed separately in the Report, but the Commission reach the conclusion that, as the two branches of the industry are so closely interlocked, there should be one marketing scheme, administered by one Board, for both. Import policy is not dealt with, because that was specially reserved for consideration by another Commission consisting of members of the two bodies that have been examining the marketing position in England and Wales and in Scotland respectively. An announcement regarding the appointment of this Commission is made on page 1212 of this issue of the JOURNAL.

The sections relating to eggs and to poultry both begin with a review of the changes in supplies and prices in recent years and an account of present methods of marketing. As regards eggs, the Commission show that production has nearly doubled in the last 10 years, but that, apart from the National Mark Scheme, very little attempt has been made to modernize marketing methods in order to dispose satisfactorily of the increased output. It has been impossible to take full advantage of the markets in industrial

* Report of the Reorganization Commission for Eggs and Poultry for England and Wales, Economic Series No. 42, obtainable from His Majesty's Stationery Office, or through any bookseller, price 1s. net, post free 1s. 4d.

MARKETING NOTES

centres, because standardized home produce has not been available in quantity. Some of the other difficulties of the egg producer are the direct result of the natural increase of production in the spring, with which the existing marketing machinery is not able to deal effectively. The formation of local gluts helps to depress producers' prices to an unnecessarily low level at that season of the year. The recommendations made later on in the Report are designed to assist in both of these respects.

The Commission have been impressed with the effect of price changes upon demand, which suggests that, if the consumption of eggs is to be maintained and increased, the aim must be to improve the returns to producers without raising prices to consumers. They believe that one step in this direction would be to introduce systematic methods of collection and marketing with the object of reducing the costs of these intermediate operations. They consider also that the interests of all parties would be served if demand could be made more regular throughout the year by some mitigation of the wide seasonal fluctuations in price.

The Commission propose that England and Wales shall be divided into some 200 "areas" of an average radius of about ten miles, in each of which areas there shall be one egg-packing station licensed by the producers' Board. Each packing station would collect the eggs of all registered producers in the area, other than those exempted under the Scheme or by direction of the Board. It is proposed to exempt producers owning less than 25 head of poultry; to give the Board power to grant other exemptions; and to make provision for sales direct to consumers to continue, subject to certain conditions.

The Commission draw attention to the difficulty of attempting to prescribe directly the prices that producers are to receive, and point out that variations in the "service" costs of assembly and distribution in different parts of the country must give rise to some differences in producers' returns. They recommend that the prices at which the packing stations are to sell eggs should be prescribed from time to time by the Board, after consultation with representatives of the distributive trades, at levels that will effectively clear supplies; and that the prices to be paid to producers should be those same prescribed prices (separately assessed for each grade) less the "service charge" approved by the Board for each station.

The packing stations would collect, test and grade the eggs and sell them to the distributive trades. The Commission attach importance to the acceleration of distributive services generally, for it is freshness that constitutes the greatest competitive advantage of home-produced eggs. In order to facilitate the distribution of eggs from the packing stations, they recommend that the areas should be grouped into twelve "regions," each region being in charge of an officer of the Board, with an office and small staff at a convenient centre in the region. One of the duties of this officer would be to assist, where necessary, in arranging the directional flow of supplies and in co-ordinating surpluses and deficiencies within the areas comprising his region. The Board would similarly co-ordinate the net surpluses or deficiencies of the regions.

MARKETING NOTES

Time would be required to build up the assembly organization that is contemplated, and the Commission recommend, therefore, that there should be an "interim period" of some 18 months before the scheme be brought into complete operation.

As part of the proposed price policy, the Commission suggest that the Board might relieve the market in the spring by putting eggs into store for release in the autumn, but they urge that, until the effects of such a policy can be judged with some accuracy, the Board should proceed with great caution.

As regards poultry, the Commission call attention to the fact that slower progress has been made in improving both production and marketing than has been the case with eggs. They consider that the concentration of producers on egg production in recent years has resulted not only in some loss of skill in the preparation of poultry for the table, but also in the breeding and distribution of stock selected for intensive egg production without much regard to its table qualities. In the Commission's view, this has led to a lack of balance in the industry which has helped to reduce the producers' returns. They believe that, since the essential needs of the two sides of the industry are the same, the aim should be to set up for poultry marketing an organization on similar lines to that proposed for eggs. As there is, as yet, so little experience to guide the Board, they recommend that, before bringing in a comprehensive scheme, the Board should prepare the ground for development by experiment in a number of directions.

In the chapters dealing with administrative matters, the Commission make detailed proposals for simplifying the electoral procedure and decentralizing administration. They propose that small committees should be elected by the registered producers in each area, and that these should form the link between producers and the Board. They further recommend that, in accordance with Section 14 of the 1933 Act, these committees, and not individual producers, should elect the members of the Board. In addition to the Area Committees, a Regional Advisory Council, composed of representatives of the Area Committees, would be constituted in each region and would act as an advisory body to the Regional Manager and the Board.

The concluding part of the report deals with some matters that are ancillary to marketing. Perhaps the most important is the problem of the increasing mortality among laying flocks. The Commission discuss some of the reasons that have been offered in evidence and recommend that the whole question of the distribution of hatching eggs, day-old chicks and breeding stock should be examined at an early date by a technical committee.

The Commission take the view that it is necessary in the interests of consumers, as well as for other reasons, that imported cold-stored eggs should be marked as such. They recognize the technical difficulty of distinguishing between "fresh" and cold-stored eggs by means of testing, and suggest that legislation should be introduced to require that *all* eggs imported into this country should be marked on the shell with the word "stored" (as well as with the indication of origin), except when the Government of the exporting country have taken adequate steps to secure that all stored eggs exported to this country were suitably marked.

Finally, the Commission call attention to the increasing interest of the public in the special problems of marketing foodstuffs. They offer some suggestions as to the further co-ordination of the activities of marketing boards and support the recommendation of the Reorganization Commission for Fat Stock that early consideration should be given to the question of acquiring detailed knowledge of the mechanism of distribution.

MARKETING NOTES

Eggs and Poultry Reorganization Commission for Great Britain.—The Minister of Agriculture and Fisheries and the Secretary of State for Scotland have appointed an Agricultural Marketing Reorganization Commission for Great Britain and charged it with the duty of investigating and reporting on the manner in which the operation of the schemes for regulating the marketing of eggs and poultry, prepared by the Reorganization Commissions for England and Wales and for Scotland, could be facilitated:—

- (a) by co-operation between the Boards administering them and between them and any corresponding body in Northern Ireland; and
- (b) by any measures affecting imports of eggs and poultry and other poultry products.

The composition of the new Commission is as follows:—

F. N. Blundell, Esq., D.L., J.P. (Chairman);
A. F. Forbes, Esq., C.A.;
Mrs. Lindsey Huxley;
James Prentice, Esq.; and
Major Mark Sprot.

Mr. Blundell and Major Sprot were the respective Chairmen of the English and the Scottish Reorganization Commissions for Eggs and Poultry.

The Joint Secretaries of the Commission are Mr. H. J. Johns, M.B.E., of the Ministry of Agriculture and Fisheries, and Mr. J. C. Russell, of the Department of Agriculture for Scotland. All communications should be addressed to the Secretary of the Reorganization Commission at 3, Sanctuary Buildings, Great Smith Street, London, S.W.1.

The Cattle Fund.—Payments under the Cattle Industry (Emergency Provisions) Act, 1934, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted at February 8, 1935, to £1,474,957. These payments were in respect of 616,180 animals, the average payment per animal being £2 7s. 10½d.

On January 30 the Minister made the following announcement in Parliament with regard to an extension of the subsidy arrangements:—

It will be recalled that the temporary arrangements for which provision is made in the Cattle Industry (Emergency Provisions) Act, 1934, were put into operation in order to give time and opportunity for full discussion with the Governments, particularly with the Dominion Governments, concerned, of the important proposals with regard to a long-term solution of the live-stock problem, contained in the

MARKETING NOTES

White Paper on the live-stock situation issued in July, 1934 (Cmd. 4651). These discussions are still actively in progress, and, recognizing the difficulty of the problems with which many of the Governments concerned are faced, H.M. Government in the United Kingdom have decided that an extension of the existing period for discussion is desirable.

It is proposed, therefore, to introduce legislation at an early date providing for further advances for a short period from the Exchequer to the Cattle Fund. Parliament will be asked to make provision in the first instance covering a period of three months. The Government earnestly trust that it will be found possible to reach an agreement, along the lines already set out in the White Paper, within that period, but the proposed legislation will provide for the possibility of a further extension, not exceeding three months, subject to the specific authority of Parliament.

Milk Act, 1934.—Advances amounting to £677,208 have to date been made to the Milk Marketing Board under Section 1 of this Act in respect of milk used for manufacture (excluding milk manufactured by the Board itself or milk used for cheese-making on farms). Details are given below, the revised figures in the earlier months being due to adjustments in claims on the Board with corresponding adjustments in Exchequer advances:—

Month in which milk was produced and manufactured	Gallons of milk used	Product	*Rate per gallon at which advances were made	Amount of advance
1934				
Apr. to Sept.	79,309,084	Butter, cheese, milk powder, condensed milk for export, and tinned cream	Varying from 2'28d. to 25d. according to month and product	£ s. d. 426,744 7 6
October ...	10,645,160			96,192 11 10
November ...	10,021,986			79,062 18 8
December ...	10,555,228			75,208 11 1
Totals ...	110,531,458	—	—	677,208 9 1

* Difference between the net cost per gallon to the purchaser of the milk or the cheese-milk price (whichever is the greater), and the standard price, which is 5d. per gallon in the summer months and 6d. per gallon from October to March, inclusive.

A further payment of £9,800 has been made to the Board under Section 3 of the Act in respect of milk manufactured into cheese on farms, resulting in the figures given in the February JOURNAL being revised as follows:—

MARKETING NOTES

Month in which milk was produced and manufactured	Gallons of milk used	Cheese-milk price	*Rate per gallon at which advances were made	Amount of advance		
1934		<i>d.</i>	<i>d.</i>	£	s.	<i>d.</i>
April	2,059 040	3'42	1'58	13,555	6	7
May	3 051,240	3'40	1'60	20,341	12	0
June	2,529,589	3'48	1'52	16,020	13	4
July	1,376,750	3'25	1'25	7,170	11	5
August	218,056	3'83	1'17	1,063	0	6
Totals ...	9,234.675	—	—	58,151	3	10

* Difference between the cheese-milk price and the standard price of 5*d.* for the summer months.

Under Section 6 of the Act, a sum of £123,659 has, by direction of the Treasury, been paid to date to the Government of Northern Ireland with the object of securing a standard price for milk manufactured into cream and butter at registered premises in Northern Ireland. This sum is made up as follows:—

Month of manufacture	Gallons of milk used for cream and butter	*Equalization payment per gallon	Equalization payment		
1934			£	s.	<i>d.</i>
April to Sept.	12,143,621	Varying from { 1 <i>s.</i> 3 <i>d.</i> to 3 <i>s.</i> 0 <i>d.</i> according to month.	101,296	5	0
October.	1,789,059		22,363	4	9
Totals	13,932,680	—	123,659	9	9

* Difference between average price paid to suppliers in any month and the standard price, which is 5*d.* per gallon in the summer months and 6*d.* per gallon from October to March, inclusive.

Cheese-Milk Price.—For the purpose of Exchequer advances under the first three Sections of the Milk Act, in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 4.23*d.* per lb. for the month of February.

Milk for Schools.—The steady growth of this scheme, which is assisted under Section 11 of the Milk Act, is indicated by the number of separate schools and other approved centres contracting for the supply of the milk, which have increased from 18,000 in October, and 21,000 in November to over 23,000 in December.

MARKETING NOTES

Imports of Processed Milks in 1934.—The arrangements for the voluntary regulation of imports of processed milks in 1934 worked on the whole satisfactorily. Imports of condensed whole milk during the year were 12 per cent. less than in 1933 and 22 per cent. less than in 1932, the last year in which imports of processed milks were entirely unregulated, and imports of condensed skimmed milk were 15 per cent. less than in 1933 and 24 per cent. less than in 1932. Imports of milk powder were 10 per cent. less than in 1933 and 21 per cent. less than in 1932, and imports of cream were reduced by 23 per cent. and 38 per cent. respectively as compared with the figures for the two preceding years.

The following table shows the quantities of condensed whole milk (sweetened and unsweetened), condensed skimmed milk, milk powder and cream imported from Empire and from foreign sources respectively during 1932, 1933 and 1934:—

	Condensed whole milk			Condensed skimmed milk (sweetened)	Milk powder (unsweetened)	Cream
	Sweetened	Unsweetened	Total			
<i>1932</i>	<i>cwt.</i>	<i>cwt.</i>	<i>cwt.</i>	<i>cwt.</i>	<i>cwt.</i>	<i>cwt.</i>
Empire	35,786	90,231	126,017	50,247	168,124	73,223
Foreign	169,627	306,998	476,625	2,088,509	152,188	63,396
TOTAL	205,413	397,229	602,642	2,138,756	320,311	136,619
<i>1933</i>						
Empire	27,334	133,514	160,848	84,662	192,965	49,489
Foreign	117,272	247,337	364,609	1,833,127	87,117	61,127
TOTAL	144,606	380,851	525,457	1,917,789	280,082	110,616
<i>1934</i>						
Empire	14,236	129,023	143,259	68,386	175,688	39,370
Foreign	108,726	212,818	321,544	1,559,747	76,861	45,984
TOTAL	122,962	341,841	464,803	1,628,133	252,549	85,354

Wheat Act, 1932.—Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1934, to February 8, 1935, cover sales of 22,084,717 cwt. of millable wheat. At the corresponding date (February 10) last year, the total sales amounted to 18,390,334 cwt.

Anticipated Supply of Millable Wheat.—The Minister, on the recommendation of the Wheat Commission, has made, under Section 2 of the Wheat Act, the Wheat (Anticipated Supply) No. 1 Order, 1935. This Order varies the Wheat (Anticipated Supply) No. 2 Order, 1934, by substituting 32 million cwt. for 29 million cwt. as the quantity of home-grown millable wheat of their own growing that it is anticipated will be sold by registered growers during the cereal year 1934-35. This variation is due to an increase in the estimated yield per acre of home-grown wheat of the 1934 harvest.

The new Order will not have the effect of increasing the total sum that will be received by registered growers as a whole on account of

MARKETING NOTES

deficiency payments, nor will it increase the amount of quota payments to be made by millers and importers of flour. The Order will, however, affect the quantity of wheat that the Minister may direct the Flour Millers' Corporation to buy in June or July next, in the event of the Wheat Commission representing to the Minister that it is expedient for him to exercise this power under the Act.

Amendment of Wheat Bye-laws, 1932.—The Minister and the Secretaries of State for Scotland and the Home Department have made the Wheat Commission (Approval of Bye-laws) No. 7 Order. This Order approves the addition of certain proprietary mixtures to those named in Bye-law 19 of which the non-flour content shall be deemed not to form part of the flour.

Wheat Offals and Liability to Quota Payments.—Judgment on the appeals of Messrs. R. & W. Paul, Ltd., and the Wheat Commission was delivered by the Court of Appeal on January 18. The Court upheld the decision of Mr. Justice Roche that the Wheat Commission's Bye-law No. 20 was *ultra vires* on the ground that it attempted to determine the scope of the Act. On the question whether the disputed parcels were flour or wheat offals, the Court reversed Mr. Justice Roche's decision, ruling that the parcels were flour, since they were not "residual products" as they had been produced by stopping the milling of flour before it had passed to its normal conclusion. The cross appeal of Messrs. Paul against the decision that the Commission was protected in respect of certain earlier consignments by the Public Authorities Protection Act, 1893, was dismissed.

Oats.—His Majesty's Government in Canada have agreed to renew for the cereal year August, 1934, to July, 1935, the understanding (which was described in the October, 1933, issue of this JOURNAL) regarding exports of oats and oat products from Canada to the United Kingdom in the cereal year 1933-34. Under the terms of that understanding the Canadian Government will use their best endeavours to ensure that exports of oats from Canada to this country during the year do not exceed 2,000,000 cwt. and that exports of oat products, including oatmeal, do not exceed 570,000 cwt., of which latter quantity not more than one-half will be oat products shipped in sacks, as distinct from packaged oats.

Beet Sugar : Production of Home-Grown Beet Sugar (1934-35 Campaign).—Returns furnished by the beet-sugar factories operating in Great Britain show that the total quantities of beet sugar manufactured during January, 1935, and the corresponding month of 1934 were:—

January, 1935	..	..	..	..	2,250,710 cwt.
„ 1934	..	..	..	..	1,364,894 cwt.

The total quantities produced during each of the manufacturing campaigns up to the end of January were:—

1934-35 campaign	..	..	..	12,078,240 cwt.
1933-34 campaign	..	..	..	9,239,875 cwt.

MARKETING NOTES

The campaign that has now ended has been a record one. The area planted to beet last year showed an increase of 24,000 acres over the original estimate. The quantity of clean beets delivered by growers to the factories represents an average yield of 10·1 tons per acre. A sugar content of 17 per cent., a sugar extraction of 15 per cent., and a total production of 608,000 tons of sugar have been realized.

Arrangements for 1935-36 Campaign.—The Minister made the following announcement in reply to a question in the House of Commons on February 6:—

The Government understand that the Report of the Committee of Inquiry into the United Kingdom sugar industry, which was appointed in April last under the chairmanship of Mr. Wilfrid Greene, K.C. is likely to be presented during the present month.

The immediate weeks of early spring are, however, vital from the point of view of cultivation. Unless the beet-sugar factories are able within that period to offer firm contracts, farmers will not be in a position to decide what crops to put in for the coming spring, and the whole position will be prejudiced before the Government or Parliament have had time to consider the Committee's Report and to determine on the future of the industry.

In order to prevent this, the Government propose to invite Parliament to make provision for a further interim measure of assistance to enable the existing factories to proceed with arrangements to secure contracts for the growing of a crop this year.

The assistance will be limited to the produce of 375,000 acres of sugar beet. It will be based on the assumption that the growers will provide approximately this acreage at a price, in respect of each factory, of 1s. per ton below that offered in fixed-price contracts in 1934.

The rate of assistance that Parliament will be asked to provide will be 5s. per cwt. of white sugar related to a raw sugar price of 4s. 6d. per cwt., with appropriate adjustments either upwards or downwards if the average price of raw sugar should vary from that figure. This rate of assistance is based on the ascertained average costs of operation. The position will be further considered on receipt of the Greene Committee's Report, and appropriate allowances will be made for capital services in so far as these may then be found to be necessary. The Government, however, reserve the right to make the grant of any such allowances conditional upon the acceptance by the industry of any measures of reform that may be proposed by the Government after consideration of the Committee's Report.

Legislation will in due course be submitted to Parliament to give effect to these proposals, which, except in so far as they involve the continuance of State assistance to the industry for another year, will leave both the Government and Parliament free to decide without prejudice upon future policy. This legislation will not be brought forward until the Report of the Committee is available and Parliament has had a full opportunity of examining it.

Regulation of Bacon Imports.—In view of the decision of the Pigs and Bacon Marketing Boards, referred to above,* to obtain during the period to April 15 next further supplementary contracts for the supply of bacon pigs in the last eight months of 1935, bacon import allocations to foreign

MARKETING NOTES

countries have now been made, in respect of the months May and June, at the same rates as those fixed for the months January to April. The allocations for these four months were published in the JOURNAL for February. Allocations for the last six months of the year will be determined in the light of the final home contract position.

National Mark Eggs.—The sixth year of operation of the National Mark Egg Scheme ended on January 31, 1935, and the following is a brief review of the scheme's progress.

The table facing shows for each month of the years 1932, 1933 and 1934, the total throughput of authorized packing stations and the quantity of eggs packed under the National Mark.

The increase in 1934, as compared with 1933, amounted to 54.3 millions in total throughput, and 55.0 millions in National Mark output; the percentage of throughput packed under the National Mark rose from 80 to 82 per cent.

The number of packing stations operating at the end of 1934 showed an increase of 30 over the number authorized at the close of 1933.

A further 30 applications for enrolment in the scheme were received during the latter months of the year. The National Mark Egg and Poultry Trade Committee (the trade advisory body that advises the Minister and the National Mark Committee in regard to the issue of authorizations to apply the National Mark to eggs) decided to defer consideration of these applications until the recommendations of the Reorganization Commission for Eggs and Poultry had been published. This was considered desirable in order that applicants should be in a position to study the report of the Commission before undertaking the provision of premises and equipment on a scale necessary to operate a National Mark station.

The increased throughput of eggs for the year is not entirely to be ascribed to the additional number of packing stations operating, but is due, in part, to an increasing appreciation of the importance of the quality factor in egg distribution and of the facilities offered by the authorized stations, as well as to the desire of producers to have their supplies packed under the National Mark, which carries with it a measure of impartial supervision of grading technique.

The continued development in the throughput of

MARKETING NOTES

NATIONAL MARK EGGS

Month	1932			1933			1934		
	Total throughput of Packing Stations (Fresh Eggs)	Throughput under National Mark	Percentage of total throughput packed under National Mark	Total throughput of Packing Stations (Fresh Eggs)	Throughput under National Mark	Percentage of total throughput packed under National Mark	Total throughput of Packing Stations (Fresh Eggs)	Throughput under National Mark	Percentage of total throughput packed under National Mark
	Millions	Millions	Percentage	Millions	Millions	Percentage	Millions	Millions	Percentage
Jan. ...	27.2	21.9	80	35.1	29.1	84	36.5	30.4	83
Feb. ...	30.7	25.6	84	35.0	28.9	82	39.0	31.8	82
March ...	45.2	36.3	80	55.7	43.6	78	59.5	48.1	81
April ...	43.5	34.7	80	52.3	39.7	77	53.2	42.1	79
May ...	40.1	32.6	81	50.6	38.9	77	56.5	46.8	83
June ...	38.1	30.3	80	42.0	32.6	78	44.9	37.2	83
July ...	30.9	24.8	80	34.5	27.6	80	41.6	33.7	81
August...	28.8	23.2	81	31.1	24.7	79	36.7	30.4	83
Sept. ...	27.6	22.7	82	30.4	24.3	80	36.3	30.5	84
Oct. ...	23.8	19.5	82	30.0	25.3	84	34.5	29.1	84
Nov. ...	21.2	18.2	86	23.7	20.4	86	28.4	24.0	84
Dec. ...	27.2	22.7	83	25.0	21.2	80	32.6	27.2	83
Total for 12 months	384.3	312.5	81	445.4	356.3	80	499.7	411.3	82

MARKETING NOTES

individual packing stations is illustrated by the following table:—

<i>Total Output.</i>		<i>No. of Stations.</i>				
		1930.	1931.	1932.	1933.	1934.
Over 10 million eggs	..	—	1	4	6	5
5 to 10 " "	..	3	10	14	22	23
2 to 5 " "	..	28	36	38	36	51
Under 2 " "	..	109	93	90	92	106

The following amendments to the scheme were made during 1934:—

(a) *Quality Control.*—As a further measure for safeguarding the National Mark as a guarantee of quality during those months when eggs are subject to rapid deterioration, officers of the Ministry have been authorized, from June to October (inclusive), to remove National Mark labels from containers of eggs on the premises of authorized packers or of their market agents when the code-marks on the labels indicate that 10 days or more have elapsed since the eggs were packed.

(b) *Code-marking of Containers.*—As a result of representations to the Ministry that the use of a stamp of the prescribed dimensions, i.e., $\frac{3}{8}$ -in. in height, for the stamping of code-dates on labels for application to small cartons to hold 1 dozen and $\frac{1}{2}$ -dozen eggs, did not, owing to the design of the label, permit of a legible impression, permission has been given for the use of a stamp $\frac{3}{16}$ -in. in height for this purpose.

During the early part of the year, a number of instances came to light in which National Mark eggs were being conveyed in fibreboard containers that did not comply with the Ministry's specifications. The manufacturers contended that the specifications were unnecessarily high, and that a revision would be of general advantage to the industry.

The question deserved consideration, but there was a difficulty in that no means existed whereby the merits of containers could be ascertained on a scientific basis. Having regard, therefore, to the rapidly-increasing use of fibreboard containers for home agricultural produce, and the consequent need for standardizing such containers, on the basis of their suitability for the purpose, the assistance of the Council for the Encouragement of Scientific and Industrial Research was sought. As a result, arrangements have been made for box-testing apparatus to be set up at the Forest Products Research Laboratory at Princes Risborough. It is expected that the laboratory will be equipped and ready to commence work on this problem during the early months of the year.

National Mark Dressed Poultry.—The total output of the authorized packing stations during 1934 was 1,177,000 birds, of which 212,400 were of "Select" statutory grade quality and packed under National Mark labels, including

MARKETING NOTES

22,000 turkeys that were graded and marked under the special National Mark Scheme for Turkeys, Christmas, 1934. The corresponding figures for 1933 were 549,744 total output and 74,180 of "Select" grade packed under the Mark. On December 31, 1934, there were 48 authorized packing stations compared with 29 at the end of 1933.

National Mark Campaign in Kent.—A National Mark Shopping "Week" will be held in Ramsgate from March 16 to 25. The Ministry will stage an Exhibition of National Mark products in St. George's Parish Hall, Ramsgate, and samples of these products will be on sale. Cookery and egg-grading demonstrations will be prominent features. Silver and bronze medals will be awarded for the winning entries in a National Mark cookery competition that is being organized.

Local retailers are arranging special displays of National Mark commodities, and cash prizes will be awarded by the Ministry for the best displays.

Display of National Mark Produce.—The Ministry occupied a stand in the Empire Section of the British Industries Fair, Olympia, from February 18 to March 1, 1935. The display of National Mark Produce included creamery butter and Stilton cheese, two of the products recently brought under National Mark Schemes.

Flowers for the King's Silver Jubilee.—Window boxes of growing flowers will be prominent in the scheme of decoration of Government buildings in Whitehall for the King's Silver Jubilee celebrations next May. The horticultural industry is presenting to the Government the necessary plants and window boxes for this purpose.

It is probable that the Ministry of Health (at the corner of Whitehall and Great George Street) will be one of the buildings to be decorated under this scheme. A design has been submitted to H.M. Office of Works and is at present under consideration. Window boxes of flowers will probably also figure in the decorative scheme of certain other Government buildings in Whitehall.

Some thousands of plants—chiefly pink hydrangeas and rhododendrons, sprengeri and dwarf box shrubs—will be used. These will be the gift of the growers, while the provision of window boxes and the actual work of decoration will be undertaken by the florists. British nurserymen are giving shrubs and trees to decorate the forecourt of Buckingham Palace.

Details of these schemes are being arranged by a special Sub-Committee of the horticultural industry, in co-operation with the Ministry and H.M. Office of Works.

MARKETING NOTES

Publicity in the Press and by wireless is likely to lead to similar schemes of window-box decoration being widely adopted throughout London. Some of the leading traders' organizations, clubs, hotels and shops have already decided to decorate their buildings with flowers.

South Australia: The Fruit and Vegetable (Grading) Act, 1934.—The Fruit and Vegetable (Grading) Act, 1934, of South Australia, assented to on November 29, 1934, empowers the Governor to make regulations for the grading and marking of fruit, vegetables and nursery stock produced or sold within the State, and forbidding the sale of such produce which is not properly graded and marked. The standards of quality may be fixed with reference to one or more of the following: shape, weight, flavour, maturity, ripeness, decay and any other factor; and they may be prescribed in regard to any fruit, vegetable or nursery stock brought within the provisions of the Act by proclamation. Inspectors appointed under the Act are given power to remove grade designation marks from goods that are below grade, to enter premises for the purpose of examining produce, and also to inspect produce in transit, or on sale.

MARCH ON THE FARM

H. G. ROBINSON, M.Sc.,
Midland Agricultural College, Sutton Bonington.

FROM the stockowner's point of view the continuation of open weather, with very little interference from either snow or severe frost, has made this one of the best winters with-in memory. When weather of this type is experienced, there is always a feeling in the background that winter conditions might still come and disturb the normal routine of farm work at a season when it is imperative that progress should be made. This, however, is one of those glorious uncertainties of farming practice, but with never a day lost through frost or really excessive rain, farm work is generally well forward—at any rate in the Midlands—and the immediate future contains no disturbing forebodings.

March, however, sees the beginning of really active work on most holdings, and this in general concerns the sowing of spring cereals and the immediate preparation of ground for roots and other crops. The guiding principle in all successful land work is to secure that important operations like seeding are carried out under the best possible conditions. This suggests that the observance of particular dates for seed-time, more or less regardless of suitable associated conditions, may give rise to unsatisfactory cropping results. This point applies similarly to the rolling of wheat crops, an operation that is now seasonable.

Some Pig-grading Results.—The grading results obtained from the bacon pigs marketed from the Midland College Farm make interesting reading.

The following represent the grading results over two-monthly periods from the inception of the scheme:—

Period	No. of pigs	Shoulder Grade				Belly Grade				Payment Grade			
		A	B	C	D	A	B	C	D	A	B	C	D
1933													
Nov.-Dec.	33	—	—	11	22	23	6	4	—	—	9	2	22
1934													
Jan.-Feb.	69	1	—	40	28	58	—	11	—	—	35	6	28
Mar.-April	41	31	—	10	—	39	2	—	—	30	11	—	—
May-June	47	35	—	9	3	42	—	5	—	30	14	—	3
July-Aug.	59	9	—	22	28	40	—	18	1	3	19	8	29
Sept.-Oct.	48	26	—	20	2	26	—	19	3	13	24	7	4
Nov.-Dec.	69	26	—	27	16	53	—	16	—	18	30	5	16

MARCH ON THE FARM

From November to February the pigs were sent to a curer at some distance from the College, whereas in the period March to December they were received by a local curer. In this latter period the grading throughout was checked by one individual. The pigs in the period November, 1933, to June, 1934, were much the same as regards breed or cross.

A great many interesting factors are coming to light as a result of concentrated work in pig-breeding, litter-recording and subsequent testing. At a recent Pig Conference at the Moulton Farm Institute, Mr. Shand of Silcock's Research Station, suggested a correlation between bonus carcasses and the heavier pigs of the litter at 21 days old. At the Midland College the initial weighings start at 42 days. Subjecting 263 pigs sent to the curer between March and December of last year to an analysis on a weight basis at 42 days, quartering the sample according to convenient weights and comparing with the ultimate grading results, the following figures represent the result:—

<i>Weight range at 42 days</i>	<i>Hogs</i>					<i>Gilts</i>				
	<i>Payment Grade</i>				<i>Total</i>	<i>Payment Grade</i>				<i>Total</i>
	A	B	C	D		A	B	C	D	
To 15½ lb.	5	14	4	15	38	8	10	2	3	23
To 19 lb. ...	7	13	5	8	33	19	12	1	4	36
To 23 lb. ...	16	11	4	5	36	14	12	—	9	35
To 32 lb. (max.)	9	17	4	5	35	16	9	—	2	27

Expressed as percentages

Lower qr. ...	13	37	10	39		35	43	9	13	
2nd „ ...	21	39	15	24		53	33	3	11	
3rd „ ...	44	31	11	14		40	34	—	26	
Upper „ ...	26	48	11	14	—	59	33	—	7	—

These figures, based on payment grades, tend to show a smaller percentage of bonus pigs (A and B) with pigs in the lowest weight group at 42 days of age. This is perhaps more marked with hogs than gilts, but specially pronounced are the superior grading results from gilts as compared with hogs.

The behaviour of the groups in respect of shoulder and belly grades expressed in percentages is as follows:—

MARCH ON THE FARM

				<i>Hogs:</i>			<i>Gilts:</i>		
				<i>Shoulder Grade.</i>			<i>Shoulder Grade.</i>		
				A	C	D	A	C	D
Lower-weight group	..			21	42	37	57	30	13
2nd	..	..	..	30	45	24	61	28	11
3rd	..	..	..	58	28	14	48	26	26
Upper	..	..	..	46	43	11	74	19	7

				<i>Hogs:</i>			<i>Gilts:</i>		
				<i>Belly Grade.</i>			<i>Belly Grade.</i>		
				A	C	D	A	C	D
Lower-weight group	..			76	21	3	65	35	—
2nd	..	..	..	70	30	—	89	11	—
3rd	..	..	..	69	28	3	88	11	—
Upper	..	..	..	66	31	3	85	15	—

In the above figures there appears to be a definite correlation between weight at 42 days and shoulder grades, especially if the figures for hogs and gilts are merged. There does not appear to be any influence, however, on belly grade.

Barley.—The cultivation of barley for malting purposes is very much a specialist's job, though as a result of the intensive investigations in connexion with the Institute of Brewing's research scheme our knowledge of the problems involved has been greatly clarified. Russell and Bishop have emphasized the importance of controlling the nitrogen content of the grain, but it would appear that it is possible to influence the quality of barley in respect of malting properties by the adoption of common-sense precautions. Medium to light loams are the typical barley soils for the reason that a more perfect seed-bed can be formed on such soils, and they have a satisfactory capacity for retaining fertility and moisture. The old-fashioned four-course rotation has broken down in its ability to furnish good malting samples. Actually it is difficult to get a satisfactory sample for malting where the crop follows roots that have been fed off by sheep. The suitability of fallow ground for producing good barley is specially emphasized, though in practice this is not an economic proposition, especially on the type of soil normally associated with barley.

Of the varieties that are specially favoured for a malting sample, Plumage Archer and Spratt Archer are leading favourites. Evenness and purity of sample are very important, so that some care should be exercised in securing seed corn that conforms to these requirements. The customary rate of seeding is $2\frac{1}{2}$ to 3 bushels per acre, with

MARCH ON THE FARM

a preference for drill rows of narrow width. The depth at which the seed is buried should be uniform over the whole field, and shallow seedings are traditionally favoured. The usual sowing depth is about $1\frac{1}{2}$ to 2 inches. The time of sowing is equally important. If the bulk can be sown in the first part of March so much the better, as such early sowings usually secure the best sample and the heaviest weight of crop. The exact date must, however, depend upon the suitability of the soil. In this respect a dust-like tilth is sometimes considered the ideal. The weather after sowing may influence the yield and nitrogen content of the grain, and early-sown fields are usually the least affected by subsequent weather changes. Where the ground has been prepared well ahead of the seed-time, and where the reserves of moisture are adequate, then a dry period after sowing is beneficial, since the plant makes a healthy start. Cold, wet weather after seeding is not conducive to healthy development, so that to this extent the production of a malting sample lies in the lap of the gods. Once the crop is suitably established, the influence of moderate rainfall is definitely beneficial.

The Conclusion of the Farming Year.—In the Eastern Midlands, Lady Day marks the commencement of a new farming year. It is now the custom under all modern farming conditions to take stock of the position and attempt to assess the prosperity or otherwise of the business of farming during the past twelve months. In reflecting upon the results one has to recognize that the pendulum has swung over in favour of the agriculturist in certain branches, but shows little or no improvement in others. Where the farming interests have been suitably mixed, the enterprise would appear to have been satisfactory, for milk-production, sheep-breeding and pig-production have all been attended with a measure of success. Although the drought during the summer of 1934 produced inconvenience in many directions, it coincided with a period when purchased food-stuffs were relatively cheap. The cropping results in general have also been more satisfactory than might have been expected. This has been particularly emphasized by the good beet tonnage realized by most growers. The principal obstacle to general agricultural recovery has been the unsatisfactory position of beef production, and many farmers feel that a solution of the problems involved is the key

MARCH ON THE FARM

to a more general prosperity for the industry as a whole. Certain it is that the dairy farmer's difficulties are likely to be intensified unless beef production attains a more paying basis than at present, for the farmer in the modern world of agriculture, with ample advice from education and other authorities, is showing a greater flexibility in farming practice than of old. This, indeed, is evident in almost every country, and particularly since the younger generation has begun to appreciate the implications of modern research and teaching.

[The Ministry desires to express its cordial appreciation of Mr. H. G. Robinson's valued services as contributor of these monthly notes "On the Farm" since June, 1933. With the present article, Mr. Robinson relinquishes the preparation of this feature, which, from the next issue (April) onwards, will be contributed by Mr. E. J. Roberts, M.A., M.Sc., of the University College of North Wales, Bangor.]

NOTES ON MANURING

F. RAYNS, M.A., and E. T. SYKES, M.A.,
Norfolk Agricultural Station.

Sugar-Beet.—The British sugar-beet crop last year occupied over 400,000 acres, and in Norfolk and Suffolk exceeded the combined acreages of mangolds and swedes. About half the root area of those counties was therefore cropped with sugar-beet. In 1935, the subsidy under the British Sugar (Subsidy) Act will be limited to the produce of 375,000 acres of sugar-beet. The reduction in acreage is just over 6 per cent., and there will be much speculation amongst growers regarding the possibility of increasing their yields by 6 per cent. The last beet crop was probably a British record, for the average yield may prove to be about 10 tons per acre; to increase it by 6 per cent. next year would raise the average to 10 tons 12 cwt.

Growers of beet must, in their own interests, continue to produce the heaviest possible crops, and the use of manures will help them, especially on land that has not been well farmed. A crop grown without manure or with insufficient manure may cost only £16 per acre to grow and yield no more than 8 tons per acre. Obviously there is no cash profit from that crop, but the additional expenditure of, say 45s. on the correct artificials, may easily increase the yield to 10 tons per acre and reduce the cost per ton of beet from 40s. to 38s. after allowing for the cost of harvesting and the delivery of the extra two tons of beet. Alternatively, a little over an extra ton per acre of washed beet of 17½ per cent. sugar content would repay the cost of the fertilizers.

The value of artificial manuring for the beet crop is convincingly shown in Report No. 16 of the Farm Economics Branch of the School of Agriculture, Cambridge ("Sugar-beet in the Eastern Counties"). These results were based on the actual yields from over 300 fields, or more than 3,500 acres, of beet in the Eastern Counties. Where no nitrogen was applied, the yield was 7 tons per acre of washed beet. When 60-70 lb. of N. (equivalent to 3 cwt. sulphate of ammonia) were applied per acre, the yield was 8.6 tons per acre. The 63 fields that received less than 30 lb. per acre of P_2O_5 gave an average yield of 7.9 tons per acre;

NOTES ON MANURING

the 143 fields that received between 30 and 70 lb. per acre of P_2O_5 (i.e., 2-4½ cwt. superphosphate) averaged 8.6 tons of washed beet; while the 101 fields that received more than 70 lb. per acre of P_2O_5 yielded 9.1 tons per acre. The response to the potash manuring was measured on the light to medium soils, i.e., where potash manuring is believed to be economic. On the 17 fields where less than 20 lb. K_2O per acre were applied the average yield was 8.2 tons. On the 33 fields where between 60 and 80 lb. per acre K_2O (equivalent to 1½-1¾ cwt. of muriate of potash) were given, the average yield was 8.8 tons; and on the 20 fields that were heavily dressed with potash (100-120 lb. per acre K_2O , equal to 2-2½ cwt. of muriate of potash) the average yield was 9.7 tons per acre.

It would be unwise, however, to take these figures as an invariable measure of the effects of nitrogen, phosphate and potash on sugar beet. Most probably the farmers who used the highest amounts of nitrogen also used heavier dressings of phosphates and potash and vice versa. Possibly, therefore, the responses from each manure are slightly exaggerated. The results of the survey are extremely valuable, however, for they emphasize the need for using a complete mixture of artificials for sugar-beet.

It may seem unnecessary in these notes to emphasize the value of manuring for beet, but there are many farmers who are still sceptical and never fail to quote single instances of failures to obtain responses. Everyone can do that, but it is as untrue as it is unfair, to argue generally upon such a flimsy basis, and much harm is done at markets and other farmers' meeting places by such misguided advertisement.

For light soils the mixture used at Sprowston is suitable; it is given in a later paragraph. For heavier soils the superphosphate should be increased to 4-5 cwt. per acre, the muriate of potash reduced to 1 cwt. per acre, and the sulphate of ammonia left at 3 cwt. per acre, assuming that farmyard manure has been used. Basic slag is also a suitable phosphatic manure for sugar-beet and may be used in place of superphosphate. The above mixture can be applied to the seed-bed in one dressing, thereby saving the labour of top dressing. On the other hand, there is experimental evidence to show that phosphates and potash are better applied early: early

NOTES ON MANURING

application, however, entails going over the field twice with the manure drill.

The correct use of manures, including farmyard manure, also increases the certainty of obtaining a "plant." Sugar-beet (like all other root crops) is most difficult to cultivate during the early stages of growth, when the attacks of fungus and insect enemies are the most severe. Thus an early supply of available plant food is very desirable, especially when the land has been deep ploughed, which, advantageous as it is in the general cultivation of the crop, makes the "plant" less easy to establish. Steps should therefore be taken to ensure a good supply of soluble plant foods on the seed-bed. This point is emphasized by the work of Knowles, Walton and Mundy, described in the *Journal of Agricultural Science* for July, 1934. The authors made a chemical study of the sugar-beet at intervals throughout the growing period, and showed that the assimilation of nitrogen and potash proceeds until the plant ripens. While, however, the plant contained less than one-half of its maximum quantity of phosphoric acid 7 weeks after singling, at the same stage of growth it contained four-fifths of its maximum quantity of nitrogen. It is thus obvious that the plant is very dependent upon early supplies of soluble food, especially available nitrogen, in its earlier stages of growth. The authors give no information as to the relative intake of nitrogen, potash and phosphate by the plants from germination to singling, but the well-known influence of phosphate in promoting early root growth applies particularly to sugar-beet, which, on phosphate-deficient soils often fails to establish a "plant."

Fertilizers with the Seed.—Increasing interest is being taken in the practice of sowing seed and fertilizer with the same drill. It is not a new process, for there are old drills still to be seen, which were designed for the combined operation. In the Fens, it is quite a common practice to sow ashes with the sugar-beet seed, the ashes being obtained by burning the trimmings from the dykes. It is claimed that earlier germination and more vigorous plants are obtained though there are no reliable experiments either to support or refute the practice.

On a field scale inconsistent results have been obtained when artificial fertilizers have been sown with the seed. In most instances the crop has benefited; in others com-

NOTES ON MANURING

plete crop failures have resulted. The literature on the subject is scanty, but there are two factors that appear to control success or failure, namely, the weather immediately after sowing, and the type of fertilizer used. A dry spell after sowing may result in damage to the germinating seed and a consequent reduction in plant. If rain falls after sowing, there is then apparently less risk of the germination being affected. The crude potash manures (kainit, and 30 per cent. potash salts) are more likely to injure germination than superphosphate or nitrate of soda. The latter fertilizer sometimes appears to stimulate germination. Sulphate of ammonia may also exert a deleterious effect, but not to such an extent as the potash manures. It should be noted that when the practice of drilling fertilizers with root seeds was common in the North of England, the manure used was bone meal or steamed bone flour, i.e., relatively insoluble forms of fertilizer. Much depends upon the relative positions of the fertilizer and the seed. Where they are in direct contact in the soil there is a serious possibility of the seeds of sugar-beet, mangolds, and similar plants being injured, but the possibility becomes more remote the further the fertilizer is placed away from the seed in the soil. Modern drills for the work are expensive, and might be improved if they enabled one to drill the manure more deeply and in a wider "ribbon." Superficially, combined seed and manure drilling should be correct, for it places the fertilizer as close as possible to the young plants. Difficulties experienced, however, suggest that until the results of further experience become available those who are considering the adoption of the practice would be well advised to proceed carefully, both in regard to the kind and the quantity of fertilizer sown with the seed.

A Practical Example of Manuring.—It is always interesting to study and criticise the practices of another farmer, especially if he is in the habit of advertising his methods. Thus it may be useful to set out the proposed manuring for the 174 arable acres of the Sprowston Experimental Farm. The outline of the manuring of the five-course rotation was given in these notes for October, 1934; it is important to add that half the barley following sugar-beet is not undersown for hay, but is cropped instead with potatoes and brussels sprouts. Thus the land (which

NOTES ON MANURING

varies from a light to medium loam) is intensively farmed and carries a large head of stock composed of bacon pigs, winter-fed cattle and sheep. The following table gives the manuring for each crop:—

<i>Crops and No. of acres per 100 acres arable</i>			<i>Superphosphate (35 per cent.) cwt.</i>	<i>Muriate of potash cwt.</i>	<i>Sulphate of ammonia cwt.</i>
1. Wheat	..	20	—	—	10
2. Barley	..	20	60 (3)	20 (1)	20 (1)
3. Sugar-beet	..	20	60 (3)	30 (1½)	60 (3)
4. Barley	..	20	—	—	—
5. { Hay	..	10	—	—	—
{ Potatoes	..	5	20 (4)	15 (3)	20 (4)
{ Brussels sprouts	..	5	20 (4)	15 (3)	20 (4)
Totals (a) per 100 ac. arable			160	80	130
(b) per arable acre			1.6	0.8	1.3
Cost per arable acre			5s. 1d.	5s. 9d.	9s. 3d.
				Total, 20s. 1d.	
Cost per arable acre (excluding potatoes and sprouts)			3s. 10d.	3s. 6d.	6s. 7d.
				Total, 13s. 11d.	

Figures in brackets indicate the dressing in cwt. per acre.

Half the wheat may need top-dressing. Half the beet tops are carted off; the remainder are either spread and ploughed in or sheeped; no artificials are therefore used for barley after sugar-beet. Cost per acre is for manures delivered to the farm, and does not include mixing or distribution.

The total cost of artificials is £70 per 100 acres arable, omitting the potatoes and brussels sprouts. Will the cost be recovered in increased yields? Experiments over a period of nine years on the sugar-beet show that 3 cwt. of nitrogenous manure, used in a balanced mixture gave on the average 1.8 tons more beet. Valued at 38s. per ton this amounts to nearly £70; thus it is probable that the cost of the whole of the manuring of the farm will be recovered by the response to the nitrogenous part of the sugar-beet manuring, leaving the beet responses to phosphate and potash, and the direct and indirect effects of the manuring of the other crops to provide the surplus return that makes the enterprise worth while—a highly satisfactory result.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended February 13				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	7 12d	7 12d	7 12d	7 12d	9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia, Neutral (N. 20.6%) ..	7 3d	7 3d	7 3d	7 3d	6 11
Calcium cyanamide (N. 20.6%)	7 2s	7 2s	7 2s	7 2s	6 11
Kainit (Pot. 14%) ..	3 0	2 14	2 12	2 14g	3 10
Potash salts (Pot. 30%) ..	4 11	4 6	4 4	4 6g	2 10
" " (Pot. 20%) ..	3 12	3 6	3 3	3 6g	3 4
Muriate of potash (Pot. 50%)	7 4	6 16	6 12	6 16g	2 9
Sulphate, " " (Pot. 48%)	8 3	7 18	7 12	7 18g	3 3
Basic slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26-27½%) ..	2 10a	2 5a	2 8a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16k	3 6
" " (S.P.A. 13½%) ..	2 15	2 11	2 15f	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	..	6 17	6 15f	6 7	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 12	5 12	5 10f	5 10	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid
Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

† Prices are for not less than 8-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

‡ Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

§ Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. B. MERCER, M.C., B.Sc. (Principal), and Colleagues.
Cheshire School of Agriculture, Reaseheath, Nantwich.

Purchasing Foodstuffs.—A very great change for the better has come over the trade in cattle foods during the past two decades. Twenty-five years ago there were, without doubt, good proprietary compound meals and cakes on the market; but there were also numerous makes and brands that would not bear analysis; and downright fraud was sufficiently common to bring this class of foods under general suspicion. Education and legislation—coupled no doubt with a development in the trade of the candour that forms such an engaging feature of modern business—have achieved wonders. Many firms who offer compounds now go beyond their statutory obligations in advertisement leaflets, while some declare the actual constituents used. As a rule mixtures of declared ingredients follow closely the prescriptions of recognized authorities, they are invariably mixed better than the farmer could mix them at home, and they are frequently offered in a very convenient ready-for-use form. Were statistics available they would probably show that the use of proprietary mixtures is increasing, and that of “straight” cakes declining—at all events relatively. Inquiry as to the number of foodstuffs submitted to advisory chemists within recent years would probably show that these also are declining. They have certainly fallen off markedly within the past ten years in the area with which the writers are most familiar.

Adulteration.—Deliberate adulteration with worthless material is now rare. Yet sickness in animals apparently rising from something they have eaten is common enough to provide advisory officers with some difficult tasks. Investigation of cases of suspected poisoning is the most unsatisfactory of the many duties falling to a county adviser's lot. So frequently the case reaches him in an equivocal form. “I've brought you,” says a man unloading a smelly sack from the back of his car, “I've brought you a cow's stomach; and I want you to find out what her died of.” Or a parcel is received by post, with an explanatory letter, “My pigs are not doing well. I think it's the food. Will

NOTES ON FEEDING

you please analyse it and let me know." Searching for possible poisons is never a straightforward job; even when there is real evidence that some deleterious substance is present, the result is often negative. Within recent months we have, despite much labour, been unable to reach definite conclusions in cases of apparent poisoning arising from *Giberella*, and from a bleaching agent employed on discoloured Danubian barley.

Certain cases, however, leave the investigator in no doubt as to ultimate causes. Once, in our experience, strychnine was found in food taken from a cow's manger. Phosphorus poisoning in fowls is neither rare nor difficult of diagnosis (apparently poisoned rats vomit before they die). We have known fowls devour chunks of unslaked lime, with disastrous results to their interior. Instances of trouble due to badly-stored or mouldy foods continue to arise occasionally, usually in meals of a starchy nature.

In our experience the commonest cause of trouble in cakes is still the dreaded castor bean. This is occasionally found in linseed cake and meal, in proprietary compounds, and more commonly in foreign earth-nut cake, particularly the screw-pressed variety. Yet castor bean poisoning cases are often difficult owing to the fact that the impurity has originally been present in only one or two bags of a large consignment; this fact, indeed, accounts for its occurrence in the cake at all, for most firms now take extraordinary pains to avoid it. It is thus quite possible for a farmer's stock to die from castor bean poisoning though samples of all the cake they are eating at the time fail to reveal its presence. Equally it is possible for two samples to be sent to two chemists, and for two equally accurate reports to be flatly contradictory.

Poisonous Herbs.*—Most cases of suspected poisoning of cattle at grass are popularly attributed either to Deadly Nightshade or to Hemlock. The former plant is known to us only as an inhabitant of botanic gardens. We have never been able to bring in a true bill against even Woody Nightshade (*Solanum dulcamara*), though that is prevalent in our hedges; nor for that matter against Hemlock (*Conium maculatum*) also not uncommon around pools. Four cases

† For an account of poisonous herbs, see Bulletin No. 75, *Poisonous Plants on the Farm*, obtainable from His Majesty's Stationery Office, paper cover 2s. (2s. 3d. post free), cloth 3s. (3s. 4d. post free).

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per sack starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British	£ 5 0	£ 0 8	£ 4 12	72	s. d. 1 3	d. 0.67	% 9.6
Barley, British feeding	5 15	0 7	5 8	71	1 6	0.80	6.2
" Canadian, No. 3 Western ..	7 12	0 7	7 5	71	2 1	1.12	6.2
" Persian	5 17½	0 7	5 10	71	1 7	0.85	6.2
" Polish	7 5	0 7	6 18	71	1 11	1.03	6.2
Oats, English, white	7 7	0 8	6 19	60	2 4	1.25	7.6
" " black and grey	7 7	0 8	6 19	60	2 4	1.25	7.6
" Scotch, white	7 18	0 8	7 10	60	2 6	1.34	7.6
" Canadian, No. 2 Western ..	8 3	0 8	7 15	60	2 7	1.38	7.6
" " mixed feed	7 0	0 8	6 12	60	2 2	1.16	7.6
" Chilian	7 17½	0 8	7 9	60	2 6	1.34	7.6
Maize, Argentine	5 3	0 6	4 17	78	1 3	0.67	7.6
" Danubian, Gal. Fox	5 0†	0 6	4 14	78	1 2	0.62	7.6
" South African, No. 2 White Flat	5 12†	0 6	5 6	78	1 4	0.71	7.6
" South African, No. 6 Yellow Round	5 10†	0 6	5 4	78	1 4	0.71	7.6
Beans, English, winter	6 0§	0 15	5 5	66	1 7	0.85	19.7
Peas, English, blue	8 0§	0 13	7 7	69	2 2	1.16	18.1
" Japanese	15 2†	0 13	14 9	69	4 2	2.23	18.1
Dari	7 2†	0 7	6 15	74	1 10	0.98	7.2
Milling offals—Bran, British " broad	6 7	0 14	5 13	43	2 8	1.43	9.9
" middlings, fine, imported ..	6 15	0 14	6 1	43	2 10	1.52	10
" weatings†	6 0	0 12	5 8	69	1 7	0.85	12.1
" Superfine†	6 2	0 13	5 9	56	1 11	1.03	10.7
" Pollards, imported	6 15	0 12	6 3	69	1 9	0.94	12.1
Meal, barley	5 17	0 13	5 4	50	2 1	1.12	11
" " grade II	8 2	0 7	7 15	71	2 2	1.16	6.2
" " maize	7 7	0 7	7 0	71	2 0	1.07	6.2
" " South African	5 17	0 6	5 11	78	1 5	0.76	7.6
" " germ	5 11	0 6	5 5	78	1 4	0.71	7.6
" locust bean	5 17	0 10	5 7	79	1 4	0.71	8.5
" bean	7 10	0 5	7 5	71	2 1	1.12	3.6
" fish, white	8 5	0 15	7 10	66	2 3	1.21	19.7
Maize, cooked, flaked	15 15	1 19	13 16	59	4 8	2.50	53
" gluten feed	6 10	0 6	6 4	84	1 6	0.80	9.2
Linseed cake, English, 12% oil ..	6 0	0 12	5 8	76	1 5	0.76	19.2
" " " 9% "	9 2	0 19	8 3	74	2 2	1.16	24.6
" " " 8% "	8 15	0 19	7 16	74	2 1	1.12	24.6
" " " 6% "	8 10	0 19	7 11	74	2 0	1.07	24.6
" " " 6% "	8 7†	0 19	7 8	74	2 0	1.07	24.6
Soya-bean cake, 5½% oil	8 7†	0 19	7 8	74	2 0	1.07	24.6
Cottonseed cake—English, Egyp- " " " 4½% oil	7 17½	1 6	6 11	69	1 11	1.03	36.9
" " " 4½% oil	5 0	0 16	4 4	42	2 0	1.07	17.3
" " " 4½% oil	4 15	0 16	3 19	42	1 11	1.03	17.3
" " " decorticated, 7% " ..	7 15†	1 6	6 9	68	1 11	1.03	34.7
" " " decorticated, 7% " ..	8 0†	1 6	6 14	68	2 0	1.07	34.7
Coconut cake, 6% oil	8 0†	0 16	5 16	77	1 6	0.80	16.4
Ground-nut cake, decor., 6-7% oil " " " imported, ...	7 7	1 6	6 1	73	1 8	0.89	41.3
" " " decorticated, 6-7% oil ..	7 2	1 6	5 16	73	1 7	0.85	41.3
Palm-kernel cake, 4½-5½% oil ..	6 10†	0 11	5 19	73	1 8	0.89	16.9
" " " meal, 4½% oil	6 10†	0 11	5 19	73	1 8	0.89	16.9
" " " meal, 1-2% oil	5 17	0 11	5 6	71	1 6	0.80	16.5
Feeding treacle	5 0	0 7	4 13	51	1 10	0.98	2.7
Brewers' grains, dried ale	5 17	0 10	5 7	48	2 3	1.21	12.5
" " " porter	5 10	0 10	5 0	48	2 1	1.12	12.5
Dried sugar beet pulp (s)	5 7	0 5	5 2	66	1 7	0.85	5.2

(a) Carriage paid in 5 ton lots.

§ At Hull.

† At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of January, 1935, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 192 per ton as shown above, the cost of food value per ton is £9 12. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 10d.; P₂O₅, 2s. 1d.; K₂O, 2s. 11d.

FARM VALUES OF FEEDING STUFFS

Farm Values. —The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	6 18
Maize	78	7.6	5 3
Decorticated ground-nut cake ..	73	41.3	7 4
„ cottonseed cake ..	68	34.7	7 15

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.65 shillings, and per unit protein equivalent, 1.14 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1934, issue of the Ministry's JOURNAL, p. 808.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s
Wheat	72	9.6	6 10
Oats	60	7.6	5 8
Barley	71	6.2	6 4
Potatoes	18	0.8	1 11
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 12
Beans	66	19.7	6 11
Good meadow hay	37	4.6	3 6
Good oat straw	20	0.9	1 14
Good clover hay	38	7.0	3 11
Vetch and oat silage	13	1.6	1 3
Barley straw	23	0.7	1 19
Wheat straw	13	0.1	1 2
Bean straw	23	1.7	2 0

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

The Agricultural Produce Index Number for 1934

A REVIEW of the index of prices of agricultural produce for the year 1934 shows that there has at last been a turn in the tide of falling prices. Prices of some of the more important agricultural commodities were appreciably higher in 1934, with the result that the annual index reached 114 (on the base 1911-13=100) as compared with 107 in 1933 and 112 in 1932. The rise of 7 points represents an increase of $6\frac{1}{2}$ per cent., and is a welcome change from the series of declines which have occurred in recent years. When allowance is made for the amounts accruing under the Wheat Act, 1932, and Cattle Industry (Emergency Provisions) Act, 1934, the index for 1934 is further increased by 5 points to 119. Fat sheep, fat pigs, milk and wool were dearer in 1934, thus repeating a feature of the changes noted in 1933. Hay, potatoes, barley and oats also sold at a higher level, but fat cattle, wheat, dairy produce and fruit were rather cheaper.

The percentage increases or decreases on the year for the commodities included in the general index were as follows:—

<i>Increases.</i>	<i>Per cent.</i>	<i>Decreases.</i>	<i>Per cent.</i>
Hay	+ 38.6	Fat Cattle	— 2.0
Wool	21.2	Eggs	2.9
Fat Sheep	15.5	Poultry	4.8
Potatoes	14.4	Cheese	7.2
Pork Pigs	10.1	Butter	7.4
Oats	10.0	Wheat	8.6
Bacon Pigs	9.8	Fruit	9.8
Barley	9.0	Hops	36.9
Milk	8.7		
Beans and Peas	6.9		
Vegetables	1.4		

Grain.—Home-grown wheat prices in January, 1934, were at the rather low level of 4s. 4d. per cwt. following upon a year of depressed prices, and although in succeeding months there was a seasonal rise to 5s. 4d. per cwt. in June and July, the tendency in the second half of the year was still downward, and the average price for the twelve months at 4s. 10d. per cwt. was 6d. lower than for 1933. The index declined by 6 points to 64, but if the effect of “ deficiency payments ” is taken into account it would be raised to 125.

MISCELLANEOUS NOTES

Barley commenced the year at the comparatively high level of 9s. 4d. per cwt. as a result of the exceptionally good prices realised for the crop of 1933. The 1934 crop also realised over average prices, the August average being 9s. 4d. per cwt. and the December average 8s. 7d., so that the annual figure of 8s. 8d. was 9d. above that of 1933. The index reached 109 and was the highest recorded since 1929. Values for oats had ruled very low in 1933, and the year closed with an average of 5s. 3d. per cwt. for December or 25 per cent. below 1911-13. But in January, 1934, the duty on imported oats was raised from 20 per cent. *ad valorem* to 3s. per cwt., and the effect was to send up the average to 6s. 5d. per cwt. in February. A slight reaction occurred in subsequent months, after which a rise took place, and in December, 1934, the average was 6s. 8d. per cwt. Over the year as a whole oats realised 6s. 3d. or 8d. per cwt. more than in 1933, and the annual index moved from 80 to 88.

Fat Stock.—Values for fat cattle showed rather abnormal movements in 1934, whereas those for pigs and sheep conformed to the usual seasonal trends. With cattle there was a fall in the first few months of the year instead of the normal seasonal rise, and second quality fell from 36s. 1d. per live cwt. in January to 34s. 7d. in April. From this point values began to rise again and reached 35s. 11d. per live cwt. in August, but, coincident with the beginning of payments under the Cattle Industry (Emergency Provisions) Act on September 1, prices began to fall, and at the end of the year the December average of 32s. 5d. per live cwt. was 2s. 3d. lower than in the previous December. The index for the year at 99 showed a fall of 2 points, but if allowance is made for four months' payments out of the cattle fund at the rate of 5s. per live cwt., the index would be raised to 104. Fat sheep values continued the upward trend which has been noticeable since November, 1932, and second quality reached a peak point for the year of 11¼d. per lb. in May. A seasonal decline to 9¼d. in December left prices 1d. above those in the corresponding period of 1933, and the average for the whole year was 1¼d. per lb. higher. The index advanced 17 points to 127, a substantial improvement on each of the two previous years. With fat pigs a peak of the price "cycle" would normally occur in 1934, and the course of prices indicates that a downward phase has now begun. Market prices for bacon pigs in December, 1933,

MISCELLANEOUS NOTES

were 10s. 11d. per score for second quality and the seasonal rise brought them to 12s. 9d. in March. The usual fall then occurred, followed by a slight rise in November and December to 10s. 8d., or 3d. less than a year earlier. Pork pig prices rose from 13s. 9d. per score for second quality in December, 1933, to 14s. 3d. in February, 1934, and after a seasonal fall to 11s. 2d. in July, they rose to 13s. 6d. in December, or 3d. less than twelve months ago. The indices for the whole year, however, were 10 points higher at 112 for bacon pigs and 11 points higher at 120 for pork pigs.

Dairy and Poultry Produce.—The calendar year 1934 comprised parts of two different milk contract years, but during the whole of 1934 the contract terms of the Milk Marketing Board were in force, whereas in 1933 only the last three months of the year were covered by the Board's terms. The indices for the two years, however, have been made upon as comparable a basis as is possible in the circumstances, and they show a rise in the wholesale contract selling price of milk from 150 in 1933 to 163 in 1934. Prices of farm butter showed the usual seasonal fall in the first half of the year and then moved upward to August; very little movement occurred thereafter, and the December average of 1s. 0½d. per lb. was 2½d. less than a year earlier. The average for the year at 11½d. per lb. was 1d. less than for 1933, and the index fell 7 points to 13 per cent. below pre-war. Cheese also was cheaper on the year, the index being reduced 8 points to 103, and the level at the close of 1934 was well below that at the end of 1933. Except for an abnormal fall in the late summer, egg prices in 1934 followed their usual course, although the annual index at 102 was 3 points lower on the year. The combined index for poultry also was lower, a fall of 6 points to 120 being recorded, all descriptions sharing in the decline.

Other Commodities.—As regards potatoes, the first half of the year 1934 was marked by an unusually low level of prices, as the harvests of 1932 and 1933 had both been over average. The 1934 crop was about normal, and values for the new crop commenced at a higher point than in either 1933 or 1932, so that even though prices declined consistently during the second half of 1934, the average for the year was about 14 per cent. higher than in 1933. Fruit as a whole averaged 29 per cent. above pre-war in the year under review, against 43 per cent. above in 1933; strawberries were dearer than a year earlier, but practically all

MISCELLANEOUS NOTES

other kinds of fruit were cheaper. The combined index for vegetables at 143 was little altered as compared with 141 in 1933, but Brussels sprouts, cauliflowers and celery were dearer, while carrots and onions were cheaper.

The hay crops of 1933 and 1934 were both under average, and the upward tendency in hay prices which was observed in 1933 developed into a considerable and continuous increase in 1934, so that both clover and meadow hay, especially the latter, showed a much higher average than in 1933. The index for both kinds taken together rose from 70 to 97, or nearly 40 per cent. In accordance with the arrangement made between the Hops Marketing Board and the brewers, hops of the 1934 crop were valued at considerably less than the high figure of just over £15 per cwt. for the 1933 crop, and the index for the latest crop was 111 or 65 points below 1933, but 6 points above 1932, and much above the indices of 51, 47 and 77 for the years 1929 to 1931. The index of wool values, as ascertained at the country market wool sales in 1934, was 80, or 14 points above that for 1933, which is equivalent to a rise of just over 20 per cent.

Index Numbers of Agricultural Produce during the Years 1929 to 1934. (Mean of the three years, 1911-13=100.)

Commodity	1929	1930	1931	1932	1933	1934
Wheat ...	130	105	76	78	70	64
Barley ...	125	100	100	96	100	109
Oats ...	125	87	88	99	80	88
Fat cattle ...	133	133	122	115	101	99
Fat sheep ...	157	160	133	97	110	127
Pigs, baconers ...	160	153	107	91	102	112
Pigs, porkers ...	165	165	123	98	109	120
Hay ...	125	118	86	69	70	97
Potatoes ...	117	96	188	197	104	119
Milk ...	169	161	147	144	150	163
Butter ...	152	128	111	102	94	87
Cheese ...	158	130	116	127	111	103
Poultry ...	152	147	144	128	126	120
Eggs ...	159	136	116	109	105	102
Fruit ...	159	117	132	180	143	129
Wool ...	126	82	52	45	66	80
Beans and peas ...	135	100	74	76	72	77
Vegetables ...	164	138	140	153	141	143
Hops ...	51	47	77	105	176	111
General Index ...	144	134	120	112	107	114

MISCELLANEOUS NOTES

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat ...	...	—	—	—	100	128	125
Fat Cattle	...	—	—	—	—	—	104
General Index	...	—	—	—	114	111	119

The Agricultural Index Number

It is a characteristic of the January index number of prices of agricultural produce that it should be about 4 points higher than in December, on account of the fact that most commodities were cheaper in January, 1911-13, than in December of those years. The index for January this year has shown the customary rise of 4 points to 117, and is 3 points above a year ago and 10 points higher than in January, 1933. If allowance is made for payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act, the January index would be 125. Most classes of live stock were a little dearer than in December, although fat cattle on average showed only very slight alteration and values for porkers and store pigs were reduced. Potatoes, hay, wheat and oats were very little changed as compared with December, whereas barley was cheaper. Milk, butter and cheese were unaltered in price, but eggs showed the usual seasonal fall.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month.	1930.	1931.	1932.	1933.	1934.	1935
January	148	130	122	107	114	117
February	144	126	117	106	112	—
March	139	123	113	102	108	—
April	137	123	117	105	111	—
May	134	122	115	102	112	—
June	131	123	111	100	110	—
July	134	121	106	101	114	—
August	135	121	105	105	119	—
September	142	120	104	107	119	—
October	129	113	100	107	115	—
November	129	112	101	109	114	—
December	126	117	103	110	113	—

Grain.—Wheat was 1*d.* cheaper on the month at 4*s.* 9*d.* per cwt., and the index declined 1 point to 65. (If allowance is made for “deficiency payment” under the Wheat Act, 1932, the index would be raised to 130.) Barley also declined, the fall of 6*d.* to 8*s.* 1*d.* per cwt. being accompanied by a drop of 3 points in the index to 101. Oats, however, were 2*d.* dearer at 6*s.* 10*d.* per cwt., and the index

MISCELLANEOUS NOTES

5 points higher at 100. As compared with January, 1934, wheat and oats were dearer by 5*d.* and 1*s.* 4*d.* per cwt. respectively, but barley was 1*s.* 3*d.* per cwt. cheaper.

Live Stock.—The average price for second quality fat cattle in January was practically the same as in December, but the base price in January, 1911-13, showed a decline, so that the index this January has risen by 5 points to 95, against an increase from 97 to 106 a year ago. (The effect of adding the cattle subsidy of 5*s.* per live cwt. would be to raise the January index to 110.) In the case of fat sheep, values have continued to rise, and the effect of this increase in price and a decline in the base years has been to raise the index by 21 points to 140, as compared with a rise of 11 points to 117 in the corresponding period a year ago. Bacon pigs were dearer than in December, and the index moved upwards by 10 points to 117. Porkers on the other hand were cheaper, but the index at 128 was 4 points higher, as the drop in prices in 1911-13 was more pronounced. In each instance, however, the indices were 8 points below those for January, 1934. The indices for store stock showed a rise in all cases, as in most instances the changes in price between December, 1934, and January, 1935, were less than in the base years. Store sheep stood at 111 or 18 points above a year ago, but dairy cows were the same at 105, while store cattle fell 3 points to 87 and store pigs 12 points to 151.

Dairy and Poultry Produce.—The January regional milk contract prices remained the same as in the previous month, and the index for milk was unaltered at 171: it was, however, 5 points above that for January, 1934. Butter and cheese were also unchanged in price on the month, but a decline in values in January, 1911-13, has resulted in higher indices for these commodities, butter rising 1 point to 83 and cheese 4 points to 97. Both butter and cheese show a decided reduction on the prices ruling a year earlier. Egg prices have pursued the usual seasonal course, but the decline of nearly 5*d.* per dozen was proportionately greater than in 1911-13, and the index fell 2 points to 95 or 2 points below January, 1934. Poultry prices increased, and the combined index was higher both on the month and year.

Other Commodities.—Potato prices fell slightly in January, the average being about 2*s.* 6*d.* per ton lower than in December, but as there was a rise of 5*s.* in the base

MISCELLANEOUS NOTES

period the index declined by 12 points to 121. This figure is, however, 17 points above that recorded a year ago. Hay prices were unchanged on the month, but a fall of 3 points occurred in the index, due to a rise in price in January, 1911-13. Hay also was much dearer than a year earlier. Vegetables on the whole were rather dearer on the month. Wool prices appreciated slightly, and the index was 4 points higher at 88.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1933	1934					1935
	Jan.	Jan.	Oct.	Nov.	Dec.	Jan.	
Wheat	72	59	67	66	66	65	
Barley	87	117	111	104	104	101	
Oats	84	80	94	94	95	100	
Fat cattle... ..	110	106	97	96	90	95	
„ sheep... ..	107	117	128	123	119	140	
Bacon pigs	99	125	99	103	107	117	
Pork	110	136	112	118	124	128	
Dairy cows	113	105	107	105	103	105	
Store cattle	107	90	85	83	82	87	
„ sheep	83	93	114	107	99	111	
„ pigs	121	163	143	147	148	151	
Eggs	94	97	115	111	97	95	
Poultry	121	115	116	114	110	121	
Milk	155	166	161	161	171	171	
Butter	97	92	84	83	82	83	
Cheese	119	114	93	93	93	97	
Potatoes	116	104	151	146	133	121	
Hay	65	79	101	104	104	101	
Wool	64	95	85	85	84	88	

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	134	130	128	127	130	130
Fat Cattle... ..	—	—	112	110	103	110
General Index	111	119	122	121	121	125

Farm Workers Minimum Rates of Wages.—Meetings of the Agricultural Wages Board were held at Kings Buildings, Smith Square, London, S.W.1, on February 5 and 18, 1935.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders:—

Bedfordshire and Huntingdonshire.—An Order fixing minimum and overtime rates of wages to come into force on February 24, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until February 22, 1936.

MISCELLANEOUS NOTES

The minimum rates for male workers of 21 years of age and over are 31s. 6d. (instead of 30s. 6d. as at present) per week of 50 hours in summer, except in the weeks in which Easter Monday and Whit Monday fall when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 31, with overtime at 9½d. per hour on weekdays, 10½d. per hour on Easter Monday, Whit Monday, Christmas Day and Boxing Day, and 11½d. per hour on Sundays (instead of 9d., 10d. and 11d. per hour respectively as at present). The minimum rate for female workers of 18 years of age and over is 6½d. per hour (instead of 6d. as at present) with overtime at 7½d. per hour on weekdays, 8½d. per hour on Easter Monday, Whit Monday, Christmas Day and Boxing Day, and 9½d. per hour on Sundays (instead of 7½d., 8½d. and 9d. per hour as at present).

Cambridgeshire and Isle of Ely.—An Order fixing minimum and overtime rates of wages to come into force on March 1, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until February 29, 1936. The minimum rates are for male workers of 21 years of age and over employed wholly or mainly as horsemen, cowmen or shepherds (other than workers employed solely as stockmen or yardmen) 38s. 6d. (instead of 37s. 6d. as at present) per week of the hours necessary for the performance of their customary duties; for other male workers of 21 years of age and over 31s. 6d. (instead of 30s. 6d. as at present) per week of 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 31, and 50 hours in summer, except in the weeks in which Good Friday, Accession Day (May 6, 1935), Whit Monday, August Bank Holiday fall when the hours are 42, provision being made for an adjustment of the hours in respect of which the minimum weekly wage is payable in the week in which August Bank Holiday falls to meet cases where an alternative holiday is given on July 29, 1935, with overtime unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays, Christmas Day, Boxing Day, Good Friday, Accession Day, Whit Monday and August Bank Holiday; and for female workers of 18 years of age and over 5½d. per hour, with overtime at 7d. per hour as at present.

Hampshire and Isle of Wight.—An Order fixing minimum and overtime rates of wages to come into force on March 3, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until December 28, 1935. The minimum rates for male workers of 21 years of age and over are 31s. (instead of 30s. 6d. as at present) per week of 41½ hours (instead of 43½ hours as formerly) in the week in which Good Friday falls, except in the case of a worker who in lieu of a day's holiday during this week is given a clear day's holiday in the following week, in which case the minimum weekly wage is payable in respect of 51 hours (instead of 53½ hours as formerly); 51 hours (instead of 53½ hours as formerly) in the week in which Easter Monday falls, except in the case of a worker who in lieu of a day's holiday in the previous week is given a clear day's holiday in this week, in which case the minimum weekly wage is payable in respect of 41½ hours (instead of 43½ hours as formerly); 51 hours (instead of 53½ hours as formerly) in any other week in summer; 40½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter, with overtime unchanged throughout the year at 8d. per hour, except in the case of carters, cowmen, shepherds and milkers for work in connection with the immediate care of animals, in which case the overtime rate is 7½d. per hour. The minimum rate for female

MISCELLANEOUS NOTES

workers of 18 years of age and over is unchanged at 5*d.* per hour for all time worked.

Herefordshire.—An Order fixing minimum and overtime rates of wages to come into force on May 1, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until April 30, 1936. The minimum rates are for male workers of 21 years of age and over employed wholly or mainly as bailiffs, waggoners, stockmen or shepherds 36*s.* (instead of 35*s.* as at present) per week (including Sunday) for all time necessarily spent on the immediate care of animals (not exceeding 60 hours) with overtime unchanged at 9*d.* per hour except for employment on Christmas Day and Good Friday where a worker has completed less than 60 hours in the weeks in which those holidays fall, when the rate is 2*d.* per hour; for other male workers of 21 years of age and over 31*s.* (instead of 30*s.* as at present) per week of 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½, and 54 hours in summer, except in the week in which Good Friday falls when the hours are 44½, with overtime at 9*d.* per hour as at present on weekdays and 10*d.* (instead of 9*d.* as at present) per hour on Sundays; and for female workers of 18 years of age and over 5*d.* per hour (instead of 4½*d.* as at present) with overtime at 6*d.* per hour except for employment on Christmas Day and Good Friday where a whole-time worker has completed less than 46½ hours in the weeks in which those holidays fall, when the rate is 1½*d.* per hour.

Lincs (Kesteven and Lindsey).—An Order fixing minimum and overtime rates of wages to come into force on March 4, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 1, 1936. The minimum rates in the case of male workers of 21 years of age and over are: for waggoners, 38*s.* (instead of 37*s.* as at present) per week of 52½ hours in the weeks in which Good Friday and Christmas Day fall; 61 hours in any other week from October 15 to May 13, and 58 hours in any other week during the remainder of the year; for shepherds 36*s.* (instead of 35*s.* as at present) per week of 45½ hours in the week in which Good Friday falls; 55 hours in any other week in summer; 47½ hours in the week in which Christmas Day falls, and 56 hours in any other week in winter, with additional payments for the lambing season; for stockmen 37*s.* (instead of 36*s.* as at present) per week of 46½ hours in the week in which Good Friday falls, 56 hours in any other week in summer, 49½ hours in the week in which Christmas Day falls, and 58 hours in any other week in winter; and for other male workers 31*s.* (instead of 30*s.* as at present) per week of 42 hours in the week in which Good Friday falls, 51 hours in any other week in summer, 39½ hours in the week in which Christmas Day falls, and 48 hours in any other week in winter with overtime in the case of all classes of male workers unchanged at 9*d.* per hour on weekdays and 11*d.* per hour on Sundays. For female workers of 17 years of age and over the minimum rate is unchanged at 5½*d.* per hour for all time worked.

Middlesex.—An Order fixing minimum and overtime rates of wages to come into force on March 3, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until February 29, 1936. The minimum rates are (1) in the case of workers employed wholly or mainly on the duties of stockmen, for male workers of 21 years of age and over 41*s.* 3*d.*, and female workers of 18 years of age and over 30*s.* per week of 40 hours in the week in which Christmas Day and Boxing Day fall, 50 hours in the weeks in which Easter Monday, Whit Monday, August Bank Holiday and any other Bank Holiday

MISCELLANEOUS NOTES

which may be proclaimed by Royal Proclamation fall, and 60 hours in any other week (instead of 60 hours throughout the year as at present); (2) in the case of workers employed wholly or mainly as carters, male workers of 21 years of age and over 38s. 6d., and female workers of 18 years of age and over 28s. per week of 38 hours in the week in which Christmas Day and Boxing Day fall, 47 hours in the weeks in which Easter Monday, Whit Monday, August Bank Holiday and any other Bank Holiday which may be proclaimed by Royal Proclamation fall, and 56 hours in any other week (instead of 56 hours throughout the year as at present); (3) in the case of casual workers, male workers of 21 years of age and over 8½d. per hour, and female workers of 18 years of age and over 6d. per hour; and (4) in the case of other workers, male workers of 21 years of age and over 34s. 4½d. in summer and 33s. in winter, and female workers of 18 years of age and over 25s. in summer and 24s. in winter per week of 42 hours in the weeks in which Easter Monday, Whit Monday, August Bank Holiday and any other Bank Holiday which may be proclaimed by Royal Proclamation fall, 30 hours in the week in which Christmas Day and Boxing Day fall, 50 hours in any other week in summer and 48 hours in any other week in winter (instead of 50 hours throughout summer and 48 hours throughout winter as at present). The overtime rate for all male workers of 21 years of age and over is unchanged at 10½d. per hour and for female workers of 18 years of age and over 7½d. per hour.

Monmouthshire.—An Order fixing minimum and overtime rates of wages to come into force on March 16, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until September 15, 1935. The minimum rate for male workers of 21 years of age and over is 33s. (instead of 31s. as at present) per week of 54 hours with overtime unchanged at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday and August Bank Holiday. The minimum rate for female workers of 17 years of age and over remains unchanged at 6d. per hour for all time worked.

Northumberland.—An Order fixing minimum and overtime rates of wages to come into force at noon on May 13, 1935 (i.e., when the existing rates are due to expire), and to continue in operation until noon on May 13, 1936. The minimum rates for male workers of 21 years of age and over employed as stewards, horse-men, cattlemen, stockmen or shepherds and hired by the week or longer period are 38s. 6d. (instead of 37s. 6d. as at present) for workers who are householders, and 35s. 6d. (instead of 34s. 6d. as at present) for workers who are not householders, per week of customary hours (not exceeding 62). For other male workers of 21 years of age and over (except workers in casual employment) the minimum rate is 31s. 6d. (instead of 30s. 6d. as at present) per week of 48 hours in winter and 52½ hours in summer, overtime being payable in the case of all regular male workers at the rate of 9d. per hour on weekdays and 11d. per hour on Sundays. For casual male workers of 18 years of age and over the minimum rate is unchanged at 7d. per hour for all time worked. The minimum rates for female workers of 18 years of age and over are unchanged at 5d. per hour for regular workers and 3d. per hour for casual workers, with overtime at 6d. per hour and 4d. per hour respectively.

Oxfordshire.—An Order fixing minimum and overtime rates of wages to come into force on March 4, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 1, 1936. The minimum rates

MISCELLANEOUS NOTES

for male workers of 21 years of age and over are 31s. 6d. (instead of 30s. as at present) per week of 50 hours in summer except in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall, when the hours are 41, and 48 hours in winter except in the week in which Christmas Day and Boxing Day fall when the hours are 31, with overtime throughout the period at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day (instead of 9d. and 11d. per hour respectively as at present). The minimum rate for female workers of 18 years of age and over is 6½d. per hour (instead of 6d. per hour as at present) with overtime at 8d. per hour on weekdays and 9½d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day (instead of 7½d. and 9d. per hour as at present).

Worcestershire.—An Order fixing minimum and overtime rates of wages to come into force on March 4, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 1, 1936. The minimum rates for male workers of 21 years of age and over are 31s. (instead of 30s. as at present) per week of 53½ hours in summer except in the week in which Good Friday falls when the hours are 44½ and 48 hours in winter except in the week in which Christmas Day falls when the hours are 39½, with overtime at 9d. per hour (instead of 8d. per hour as at present). For female workers of 18 years of age and over the minimum rate is unchanged at 5d. per hour with overtime on Sundays and in excess of 8 hours on any other day at 5½d. per hour as at present.

Denbigh and Flint.—(1) An Order fixing minimum and overtime rates of wages for workers other than male workers wholly or mainly employed in forestry and to come into force on February 16, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until February 15, 1936. The minimum rate for male workers of 21 years of age and over employed wholly or mainly as team-men, cattlemen, cowmen, shepherds or bailiffs is 35s. 6d. (instead of 34s. as at present) per week of 60 hours. For other male workers (except casual workers) of 21 years of age and over the minimum rate is 30s. 6d. per week of 48 hours in winter and 50 hours in summer (instead of 50 hours in winter and 54 hours in summer as at present). The overtime rate for male workers of 21 years of age and over (other than casual workers) remains unchanged at 9d. per hour. For casual male workers of 21 years of age and over the minimum rate is 8d. per hour for all time worked. For female workers of 18 years of age and over the minimum rate is unchanged at 5d. per hour per week of 48 hours with overtime at 6½d. per hour.

(2) An Order fixing minimum and overtime rates of wages for male workers employed wholly or mainly in forestry to come into force on February 16, 1935 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until February 15, 1936. For male workers of 21 years of age and over the rate is 35s. per week of 50 hours with overtime at 9d. per hour.

Glamorganshire.—An Order continuing the operation of the existing minimum and overtime rates of wages from March 2, 1935 (i.e., the day following that on which the existing rates are due to expire) until March 1, 1936. The minimum rates for male workers of 21 years of age and over employed wholly or mainly as stockmen, cattlemen, cowmen, horsemen, shepherds or bailiffs are 37s. per week of 60 hours with overtime at 10d. per hour,

MISCELLANEOUS NOTES

and for other male workers of 21 years of age and over 33s. 6d. per week of 52 hours in summer and 48 hours in winter, with overtime at 9d. per hour on weekdays and 10d. per hour on Sundays. For female workers of 18 years of age and over the minimum rate is 6d. per hour with overtime at 7d. per hour on weekdays and 7½d. per hour on Sundays.

Enforcement of Minimum Rates of Wages.—During the month ending February 14, legal proceedings were taken against two employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area.			Court.	Fines imposed.	Costs allowed.	Arrears of wages ordered.	No. of workers involved.
Notts.	...	...	Bingham ...	£ s. d. 2 0 0	£ s. d. —	£ s. d. 11 6 11	2
Lancs.	...	...	Garstang ...	10 0	12 0	55 1 5	2
				£2 10 0	12 0	66 8 4	4

Some Wireless Talks to Farmers in March

Date: March	Station	Time	Speaker	Subject
6, 13, 20, 27 } 4	National	6.45 p.m.	Mr. John Morgan	Topics of the season
	Midland	8. 0 p.m.	Messrs. Geoffrey Boumphrey and Graham Castle	Discussion on Village Life To-day
7, 21	"	6.30 p.m.	Mr. W. B. Thompson	For Midland Farmers
2	West	8.30 p.m.	Mr., Mrs., the Misses and Master Webb, Messrs. A. W. Ling, N. Norton Matthews and another	The Farming Year. A monthly review of work on the farm
14	"	6.30 p.m.	Mr. A. W. Ling	Review of the Situation
7	North	6.30 p.m.	Mrs. Bromley Davenport and Mrs. L. B. Boffey	Discussion on women's work as applied to farming in the North
8, 22	Scottish	6.40 p.m.	Mr. W. G. R. Paterson	Scottish Farmers in Particular
13	"	6.50 p.m.	Mr. G. W. MacAllister	Our Bird Visitors
14	"	7. 0 p.m.	Mr. G. G. Middleton	Beef Production in Scotland
28	"	6.30 p.m.	Mr. J. Caldwell	Sugar Beet, Growth and Cultivation

NOTICES OF BOOKS

APPOINTMENTS

County Agricultural Education Staffs ENGLAND

- Hampshire.**—Mr. T. E. Whittle, N.D.P., has been appointed Assistant Instructor in Poultry-keeping at Sparsholt Farm Institute, *vice* Mr. W. Wells, N.D.P.
- Mr. J. A. Duncan, B.Sc. (Agric.), N.D.A., N.D.D., has been appointed Assistant County Dairy Instructor.
- Herefordshire.**—Mr. R. N. Vaisey has been appointed Manager of the County Egg-laying Trials, *vice* Mr. S. F. Siderfin.
- Middlesex.**—Mr. P. E. Cross, N.D.H., has been appointed Superintendent of Commercial Horticulture.
- Staffordshire.**—Mr. G. H. Bates, D.Sc., has been appointed Agricultural Organizer and Principal of the Staffordshire Farm Institute, *vice* Mr. J. C. Rushton, F.H.A.S., who is retiring.
- Sussex, West.**—Mr. E. A. Bartlett, N.D.A., has been appointed Assistant Agricultural Organizer, *vice* Mr. J. C. W. Simms, B.Sc., N.D.D.
- Worcestershire.**—Mr. E. W. Hobbis, N.D.H., has been appointed Instructor in Horticulture.

WALES

- Denbighshire.**—Mr. Emrys Davies, B.Sc., Instructor in General Science, has resigned.
- Glamorganshire.**—Mr. D. E. Davies, M.R.C.V.S., Instructor in Veterinary Hygiene, has been appointed to another Department of the Glamorgan County Council.
- Monmouthshire.**—Mr. E. W. Hobbis, N.D.H., Horticultural Instructor, has resigned.

NOTICES OF BOOKS

Jared Eliot, 1658-1763: Essays upon Field Husbandry in New England and other papers, 1748-1762. Ed. by H. J. Carman and R. G. Tugwell. Bibliographical Sketch by R. H. True. Pp. lvi + 261. Illus. (New York: Columbia University Press. London: Humphrey Milford. 1934. Price 17s. 6d.)

Research into the history of farming is often regarded as a field of inquiry extremely narrow and restricted: but this view can easily be combated. Man's earliest preoccupation is his food supply, and only when that is assured is there enough leisure to think of other needs or luxuries. The story of farming and its development is thus the story of mankind, and it impinges upon, if it does not always include, the whole gamut of human activities. The production of the food supply and its processing and distribution, once a matter of local subsistence, has now broadened its basis to that of world markets. In the course of this development enormous changes have taken place in the organization of society and in habits of life; but all the modern social order and way of life has its roots in the agricultural past of the great communities, and many inexplicable habits and customs can only be explained by reference to that past.

So it is that the history of farming is of the greatest importance to all our modern urban civilizations. In the old world the story is lengthy and involved; in the new, it is comparatively brief if it is restricted to the occupation of the Whites, although a great deal of the early technique of farming in New England was borrowed from the Indians. But a period of only some 300 years has elapsed since

NOTICES OF BOOKS

then, and in that time a Continent has been subdued. In spite of the hurry of events and the dimensions of the landscape in which such a transition has so rapidly been brought about, the story is one that it should be possible to tell more easily than that of the older civilizations.

The editors of the present volume show a complete appreciation of this fact and of the lack of readily accessible material from which the story of American farming can be learned. It is with the idea of providing the material and finally of telling the whole story that this series had been started.

The selection of Jared Eliot and a reprint of his "Essays" to commence the series seems admirable. Eliot was characteristic of all that was best in the XVIIIth century both in America and in England, and since the production of a constant adequate food supply was one of the prime considerations in America, it is natural that he should have been interested in farming. A physician and a minister who spent much of his time a-horse, travelling through a thinly populated country, Eliot had exceptional opportunities during his early life of becoming intimately acquainted with the technique of farming as it was then practised. His shrewd, analytical and trained mind readily correlated the information he gathered and easily observed the disparities between the more advanced technique of the Old World and that of the New. It was, however, only in his later years that he was able to carry out his plan for a series of annual essays on the subject, which won him widespread recognition on both sides of the Atlantic.

Many of the improvements he puts before his readers will be familiar to students of contemporary and slightly precedent writings issued in this country, but they were doubtless somewhat chancy novelties to his fellow countrymen. Draining, clay on sand and sand on clay, the introduction of clover, the drill, are all familiar topics of the day; but it must be admitted that Eliot's design of drill appears a more practical implement than many of the designs illustrated in contemporary English publications. Further, Eliot was almost as early in his recognition of the value of Tull's work and writings as farmers on this side of the Atlantic.

Experiment was much discussed in the XVIIIth century, and Eliot had a complete understanding of its value. He did not, as so many English writers did, promise exaggerated rewards to those who had the wisdom to follow his advice, but always maintained that it was essential that they should first try out the proposed improvement on a small scale.

Eliot must have been a pleasant person and his charm is reflected in his writings. His editors have dealt liberally with him, and the production sets a high standard for future studies in the series, which should be not only of interest to students of the history of American farming, but provide material for interesting comparisons with the type and rate of change in the Old World.

Handbuch der Ernährung der landwirtschaftlichen Nutzpflanzen. (*Treatise on the Nutrition of Cultivated Plants.*) By J. Becker-Dillingen. Pp. viii + 523; 124 figs. and 12 coloured plates. (Berlin: Paul Parey, Hedemannstrasse 28 & 29, S.W.11. 1934. RM. 19.60.)

To British readers the chief value of this book will be as a reference volume to German work on manuring; it is particularly suitable for this purpose owing to the heavy preponderance of German workers among the authorities quoted. This lack of balance may be accounted a defect, since the book was written not only for farmers, but for teachers and students. It may therefore give a false idea of the contributions of other countries to agricultural science, while providing insufficient information about important branches of the subject. A glaring example is to be seen in the section on field experiments

NOTICES OF BOOKS

for determining manurial requirements; in view of the amount of work on the application of statistical methods that has been published of recent years in journals and books in the English language, and the enhanced value of well-designed replicated experiments, this section can only be described as puerile. It is unworthy of the standard of the later part of the book.

Since the chief emphasis is placed on plant nutrition—plant physiology and manuring—the section devoted to soils is relatively brief, but it is comprehensive. It might, however, be criticized in detail; e.g., the sizes of particles given for the fractions of a mechanical analysis are not those agreed upon in the International Method.

The most important part of the book is that dealing with manures and manuring. The general account of artificial fertilizers is well balanced and up to date, while the production and handling of farm-yard manure, liquid manure, and similar materials are treated in more detail than one often finds in text-books in English. There is also a section on "Biological-dynamic" manuring, which is based on a reversion to the ideas of the Middle Ages on the part of the Anthroposophists, mystical followers of Rudolf Steiner. Their opposition to the use of artificial fertilizers appears to have caused some concern in German agricultural circles. It is interesting to find here the results of comparative experiments on "biological-dynamic" manuring, and consoling to see that it was far less effective than artificials alone or with dung.

Outstanding is the account of the manuring of individual crops. This is the most original and valuable part of the book. Some fifty crops are treated, and for most of them are given tables of ash and dry matter analyses, striking diagrams showing progressive stages in growth and nutrient uptake, and detailed accounts of the influence of fertilizers and soils. There are also coloured plates showing in memorable fashion the leaf symptoms exhibited by the chief types of crop plant suffering from nutrient deficiencies.

Your Meals and Your Money. By Gove Hambidge. Pp. xvi + 190. (New York and London: McGraw-Hill Book Co. Inc. 1934. Price 6s.)

The aim of this book, as its title suggests, is to explain in popular language and style the most efficient way of converting money into nutriment. The book is based on the work of American food economists, and many of the data have been taken from a Bulletin issued by the United States Department of Agriculture, *Diets at Four Levels of Nutrition Content and Cost*. The author starts from the premise that the average human being requires about three-quarters of a ton of food a year to keep him in bodily well-being. From this two questions arise, the answers to which are closely inter-related: what are the best foods for the purpose and how can these be obtained most economically? The problem is attacked from the standpoint of four different income levels.

The author points out that the need for a carefully planned diet becomes more acute as the money available to spend on it decreases, and it is suggested that much of the malnutrition among the poorer classes might be avoided if the money available for food were spent on a planned diet.

The author broadly places the food groups, which he considers of primary importance and which should figure daily in the dietary, in the following order:—milk and milk products, tomatoes and/or citrus fruits, leafy, green and yellow vegetables, and grain products. He recommends that in general both adults and children should consume a quart of milk a day, since milk contains the protein most nearly adapted to human needs and practically all that is required in phosphorus, calcium and vitamins A and G.

The book is well supplied with tables, and also contains an outline of the United States Department of Agriculture's grading scheme for

NOTICES OF BOOKS

agricultural products. The author shrewdly observes that the grades for canned goods should be "as simple and as universal as possible and as understandable as they can be made. . . . Instead, we have, in the case of canned goods, all sorts of fancy names that mean nothing to the consumer, 'Superior,' 'Superb,' 'Selected,' 'Extra Special.' The canner or distributor uses such term as he thinks sounds good and will attract the buyer, but that in fact represents only his personal taste in adjectives."

Although written for an American public, this book will be found interesting and instructive to people in this country, where conditions are not unlike those obtaining in the United States.

Everyday Botany. By L. J. F. Brimble, B.Sc. Pp. viii + 589, and 340 figs. (London: Macmillan & Co., Ltd. 1934. Price 7s. 6d.)

Educationists generally are in favour of including biology in all school curricula, and this book has been written to stress the equality in importance of botany with other sciences. The author believes that the value of botany can best be vindicated by showing the application of botanical principles in industries that utilize plant products, and in everyday life; these various aspects of applied botany are touched upon, in addition to providing a text book for the student working for matriculation or school certificate.

The production of vegetable oils, sugar and cotton are dealt with, and an interesting chapter on fruit and fruit cultivation gives a good idea of the importance of botany to the fruit grower. In connexion with fungi the economic importance of plant diseases and the system of organized research in plant pathology on an Imperial basis are explained. In view of examination requirements plant physiology is discussed in some detail, but systematic botany is reduced to a minimum, since the author believes that "a study of plant classification can never be made with either profit or interest from a book," and the student is advised to join a natural history society and to collect and identify specimens for himself.

Reference to the chief personalities who have helped to build up botanical science, and illustrations of the application of the science to industry, help to show that botany is a vital rather than an academic science, and make this volume an attractive substitute for the old-fashioned text-book.

Special Manures for Garden Plants. By A. J. Macself. Pp. viii + 152, and 17 figs. (London: W. H. & L. Collingridge, Ltd. 1934. Price 3s. 6d.)

This little book has apparently been prepared for amateur gardeners who possess little knowledge of the subject of plant nutrition and the fundamental principles underlying the application of manures to crops. The first seven chapters, dealing with the physiology of plant nutrition, manures, both organic and inorganic, and the use of lime, have been prepared on the lines of modern text-book doctrine, although, in the absence of a bibliography no authorities are available for the statements made. A few generalizations of rather a sweeping nature might have been omitted, e.g., that on page 68: "peat lands . . . are too acid for plants other than those which belong naturally to such soils." The author should know that the largest area of peaty land in England, the Cambridgeshire Fens, is mainly of a cretaceous nature, and will grow almost any crop successfully. The statement on page 36 that night soil should be *burned* in a pit before use as a manure is obviously a misprint that could have been amended with advantage.

The latter part of the book dealing with manures for special purposes is less satisfactory. With little to draw upon save empirical knowledge, the author has made not a few statements, and given advice, that are open to question. Little experimental work has

NOTICES OF BOOKS

been done on vegetables, but some has certainly been done on the subject of fruit-tree manuring. The chapter on "the principal fruits" might, therefore, have said something about the importance of balance and the effect of potash starvation on apples. The application of fertilizers to fruit trees in June is recommended on page 90 and in May on page 94. It is extremely doubtful whether such a recommendation can be supported. Fertilizers should go on in January or February at the latest if they are to have effect the same season. The author repeats the old theory that stone fruits (cherries, plums, etc.) must have a good supply of lime if they are to grow and fruit satisfactorily (p. 94). Research work has given little, if any, support to this idea.

The chapter on manures for vegetable crops does not allow sufficiently for the many types of soils used for vegetable growing. It is because of this that recommendations of a general nature are of little real value. No attempt is made, for example, to stress the importance of potash for the onion crop, while many would not support the use of kainit for potatoes or the importance of lime for tomatoes. On the whole this chapter is disappointing, considering the importance of the subject.

The final chapter is a reproduction of the data compiled by the late Dr. A. B. Griffiths containing formulæ for the manuring of greenhouse plants, hardy and half-hardy annuals, perennial flowering plants, fruit trees and vegetables. These notes are very brief, and allowing for the fact that they do not discriminate between one type of soil and another the formulæ given are of a reliable nature.

The Meteorological Observer's Handbook. Pp. viii + 169; 30 figs. and xxxii plates. (London: H.M. Stationery Office. 1934. Price 5s.)

This manual is issued by the Meteorological Office, primarily for the use of official observers. The first part consists of directions and hints for observers on the employment of ordinary (non-recording) instruments, and the description of weather conditions. The recording of all common conditions, and many rarer phenomena, are fully covered. The second part includes descriptions of recording meteorological instruments, with instructions for their use. The third part consists of tables. The illustrations include 17 admirable photo-gravure plates of cloud forms.

The Weekly Weather Report. Vol. L. Pp. 72. (His Majesty's Stationery Office. Price 7s. 6d.)

This Report, issued by the Meteorological Office, contains data relating to temperature, rainfall and sunshine for each week from the beginning of spring, 1933, to the end of the following winter period, i.e., February 26, 1933—March 3, 1934. The tables are arranged so that the whole sequence of data (with deviations from the normal) for a single station occupy one page. The principal tables give data in this form for 57 selected stations, well distributed over the British Isles. Other tables show the normal values for the twelve climatological districts of the British Isles and the deviation from normal in each week and in each of the four seasons.

The tables show that during the period under review there was a deficiency of rainfall in all districts and an excess of sunshine in most districts. The rainfall deficiency varied from 17 per cent. in the Channel Isles to 37 per cent. in England N.W. and North Wales. Mean temperature was substantially above the normal in all districts; spring and summer being particularly noteworthy in this respect.

The publication is obtainable from His Majesty's Stationery Office (London, Edinburgh, Manchester, Cardiff and Belfast) or through any bookseller, price 7s. 6d., postage extra.

INDEX TO VOL. XLI.

APRIL, 1934, TO MARCH, 1935.

Acts of Parliament, Orders, etc.:	PAGE
Agricultural Produce (Cereals) Act (1934): Irish Free State ..	907
Agricultural Wages (Regulation) Act (1924)	210, 622
Agriculture (Emergency Powers) Bill: New Zealand ..	986
Animal and Animal Products Act: Germany	989
Bacon (Import Regulation) Order (1934)	184
British Sugar (Subsidy) Act (1934)	59, 486
Cattle Industry (Emergency Provisions) Act (1934) 537, 678, 1002, 1212	
Dairy Produce Act (1933): Australia	492
Destructive Insects and Pests Acts (1877-1927)	305, 863
Fruit and Vegetable (Grading) Act (1934): South Australia ..	1222
Horse-Breeding Act (1918), Licensing of Stallions under ..	774
Law of Property Act (1922)	1154
Live Stock and Meat Industries Act (1934): Union of South Africa	988
Marketing of Potatoes Act (1934): Northern Ireland	491
Merchandise Marks Act (1926)	426
Milk Act (1934) 484, 570, 679, 979 1041, 1093, 1213	
Natural Products Marketing Act (1934): Canada	685, 1099
Seeds Act (1920), Operation during Season 1933-34	858
Slaughter of Cattle and Sheep Act (1934): Irish Free State ..	684
Wheat Act (1932) 62, 574, 667, 980, 1094, 1215	
Additions to the Library, see <i>Library</i> .	
Agricultural Returns and Statistics, see <i>Publications (Off. ial)</i> :	
Index Number .. 87, 206, 302, 403, 511, 600, 708, 810, 928, 1031, 1240, 1244	
Output of England and Wales (1930-31)	409
Prices in Germany	168
Returns of England and Wales (1934) 579, 932, 1102	
Statistics: Appeal to Occupiers of Agricultural Land	109
Agricultural Studentships, see <i>Scholarships</i> .	
Agricultural Wages, see <i>Wages</i> .	
Alternative Systems of Heating Glasshouses	632
Apiculture: Brood Diseases of Bees 829, 1034	
Foul Brood of Bees	89
National Mark Honey	784
Apple Scab Spraying Experiments in the Wisbech Area	1190
Apples, see <i>Marketing</i> .	
Appointments 216, 312, 411, 514, 606, 816, 935, 1037, 1132, 1252	
Artificial Drying of Young Grass	1049
Austin, M. D., S. G. Jary and H. Martin: Control of the Common Capsid Bug	1195
Bacon, see <i>Marketing</i> .	
Bates, G. H., and F. Rayns: (Monthly) Notes on Manuring ..	1112
Beef, see <i>Marketing</i> .	
Bees, see <i>Apiculture</i> .	
Beet, see <i>Sugar-beet</i> .	
Birdsfoot Trefoil	162
Black Currants, see <i>Fruit</i> .	
Blenkinsop, A: Observations on Potato-Sick Soils in Devon and Cornwall	1187
Book Notices, see also <i>Library</i> and <i>Publications</i> .	
Advisory Report on Arable Land, Sheep Husbandry and Poultry Keeping in Wiltshire (ed. W. T. Price)	609
Agricultural Progress, Vol. XI	520
Agricultural Register (1933-34)	520
Agriculture of England and Wales (H. Keldorfer) ..	936
Agriculture: Science and Practice of British Farming (J. A. Scott Watson and J. A. More)	412
Altalanos Talajtan (A. de 'Signmond)	609
Aménagement des Fumiers et des Purins (M. Ringelmann) ..	1139
Animal Breeding in the British Empire (F. Fraser Darling) ..	419
Australia as Producer and Trader (1920-32) (N. Windett) ..	818

Book Notices: (continued)

	PAGE
Barn Owl in England and Wales (<i>G. B. Blaker</i>)	520
Bibby's Book on Milk	419
Bibliographical List of the Entire Domain of Agricultural Chemistry (ed. <i>H. Niklas</i> and <i>A. Hock</i>)	1139
Bird Food Charts	822
Brewing and Malting (<i>J. Ross-Mackenzie</i>)	820
British Economic Grasses (<i>S. Burr</i> and <i>D. M. Turner</i>) ..	607
British Goat Society's Yearbook (1934) (ed. <i>H. E. Jeffery</i>) ..	417
Brood Diseases of Bees	829
Care and Repair of Ornamental Trees (<i>A. D. C. Le Sueur</i>) ..	100
Change in the Farm (<i>T. Hennell</i>)	607
Changes in Quality Values of Farm Machines between 1910-12 and 1932 (<i>J. B. Davidson</i> , <i>G. W. McCuen</i> and <i>R. V. Blasingame</i>)	822
Commercial Fertilizers (<i>G. H. Collings</i>)	717
Commercial Flower Forcing (<i>A. Laurie</i>)	720
Co-operation in Changing Italy (<i>K. Walter</i>)	719
Countryman's Jewel (ed. <i>M. Woodward</i>)	714
Cultivation of Orchids (<i>J. Gratiot</i>)	1140
Danish Smallholding (<i>M. H. Molte</i>)	99
"Degeneration" of the Strawberry	519
Die Landwirtschaft von England und Wales (<i>H. Keldorfer</i>) ..	930
Disposition of Animal Dung and Urine (<i>M. Ringelmann</i>) ..	1139
Drama of Weather (<i>Sir Napier Shaw</i>)	519
Economic Plants (<i>E. E. Stanford</i>)	1136
Effect of Butter and Cheese Supplies on "Surplus" Milk Prices (<i>R. L. Cohen</i> and <i>K. A. H. Murray</i>)	420
Eggs (<i>M. E. Pennington</i> , <i>F. L. Platt</i> and <i>C. G. Snyder</i>) ..	717
Eleavage Moderne et l'Industrie du Lapin (<i>L. Bréchemin</i>) ..	414
English Agricultural System in the XIXth Century (<i>P. Flavigny</i>)	823
Everyday Botany (<i>L. J. F. Brimble</i>)	1255
Experimental Production and Diagnosis of Frost Injury on Forest Trees (<i>W. R. Day</i> and <i>T. R. Peace</i>)	824
Farm and Machine	318
Farm Machinery (<i>A. A. Stone</i>)	818
Fighting the Insects (<i>L. O. Howard</i>)	100
Foundations of Agricultural Economics (<i>J. A. Venn</i>)	415
Garden Science: A Three Years' Course (<i>R. Berks</i>)	717
Gemüsekrankheiten (<i>O. Appel</i>)	413
Genetics and Animal Production (<i>C. Kronacher</i>)	1135
Genetik und Tierzüchtung: Handbuch der Vererbungswissenschaft: (<i>C. Kronacher</i>)	1135
Grassland Seeds	821
Handbuch der Ernährung der landwirtschaftlichen Nutzpflanzen (<i>J. Becker-Dillingen</i>)	1253
Handling and Storage of Grain (<i>H. H. Broughton</i>)	99
Hard Winter Wheat Pools (<i>J. G. Knapp</i>)	420
Hatchery Management (<i>R. C. Hartman</i>)	98
Hooton Pagnell: The Agricultural Evolution of a Yorkshire Village (<i>A. G. Ruston</i> and <i>D. Witney</i>)	1133
Hop Industry (<i>H. H. Parker</i>)	1133
Index Veterinarius	413
International Yearbook of Agricultural Statistics	308
Introduction to Plant Biochemistry (<i>C. C. Steele</i>)	1134
Jared Eliot (1658-1763): Essays upon Field Husbandry (ed. <i>H. J. Carman</i> and <i>R. G. Tugwell</i>)	1252
Journal of the Orkney Agricultural Discussion Society (1934)	1140
Land Problems of India (<i>R. Mukerjee</i>)	518
Life of the Rook (<i>G. K. Yeates</i>)	608
Literatursammlung aus dem Gesamtgebiet der Agrikulturchemie (ed. <i>H. Niklas</i> and <i>A. Hock</i>)	1139
Making a University (<i>W. MacBride Childs</i>)	608
Manual of Plant Diseases (<i>F. D. Heald</i>)	412
Manual of the Timbers of the World (<i>A. L. Howard</i>) ..	418

INDEX

V

Book Notices: (continued)	PAGE
Man versus Rabbit (<i>A. H. B. Kirkham</i>)	935
Memories at Eventide (<i>Sir Edward Brown</i>)	1138
Meteorological Observer's Handbook	1255
Methoden für die Untersuchung des Bodens (ed. <i>O. Lemmermann</i>)	718
Methods of Soil Investigation (ed. <i>O. Lemmermann</i>)	718
Milk Trade: A Comprehensive Guide (ed. <i>C. Raison</i>)	216
Modern Bee-keeping (<i>H. Mace</i>)	216
Modern Flower Growing for Profit (<i>W. E. Shewell-Cooper</i>)	819
Moutons de Plein Air (<i>J. Troupeau-Housay</i>)	719
National Farmers' Union Yearbook (1934)	417
New Zealand Dairy Industry (<i>G. A. Duncan</i>)	411
Open-air Dairying (<i>R. N. Dixey</i> and <i>M. Messer</i>)	98
Open-air Sheep Farming (<i>J. Troupeau-Housay</i>)	719
Orchidées: Leur Culture (<i>J. Grathot</i>)	1140
Our Garden Birds: Their Food, Habits and Appearances (<i>H. Mortimer Batten</i>)	1138
Owner-Gardener (<i>Sir Edward Anson</i>)	417
Petite Ferme Danoise (<i>M. H. Motte</i>)	99
Pig-keeper's Pocket Book and Diary, 1935 (ed. <i>W. O'C. Holmes</i>)	1137
Pflanzenbaulehre für Landwirte (<i>A. Zade</i>)	515
Planning of Agriculture (<i>Viscount Astor</i> and <i>K. A. H. Murray</i>)	94
Planning of Britain's Food Imports (<i>K. A. H. Murray</i> and <i>R. L. Cohen</i>)	1157
Plant Parasitic Nematodes and the Diseases they Cause (<i>T. Goodey</i>)	415
Plants and Human Economics (<i>R. Good</i>)	610
Poultry Diseases (<i>B. F. Kaupp</i>)	96
Practical Animal Husbandry (<i>W. C. Müller</i>)	818
Practical Bacteriology: Introductory Course for Students of Agriculture (<i>A. Cunningham</i>)	1038
Practical Poultry Management (<i>J. E. Price</i> and <i>H. E. Botsford</i>)	720
Practice and Science of Breadmaking (<i>D. W. Kent-Jones</i>)	1136
Principles and Practice of Marketing (<i>R. Simmiat</i>)	715
Probleme Mondial du Blé (<i>P. de Hevesy</i>)	716
Pruning of Hardy Fruit Trees (<i>H. Dunkin</i>)	517
Rabbit Book (<i>F. L. Washburn</i>)	99
Recent Advances in Plant Physiology (<i>E. C. Barton-Wright</i>)	95
Recent Advances in the Study of Plant Viruses (<i>K. M. Smith</i>)	1038
Regime Agricole en Angleterre au XIXe Siècle (<i>P. Flavigny</i>)	823
Report on Co-operation in India and Europe (<i>I. D. Gamman</i>)	97
Rose Encyclopædia (<i>T. W. Henslow</i>)	1040
Rural Britain To-day and To-morrow (<i>J. A. Scott Watson</i>)	419
Rural Exodus in Germany	820
Short Course in Elementary Meteorology (<i>W. H. Pick</i>)	414
Silo-Sparwirtschaft (<i>L. F. Kuckler</i>)	609
Simple Pruning (<i>N. Catchpole</i>)	101
Sisal (<i>S. G. Barker</i>)	96
Small-Fruit Culture (<i>J. S. Shoemaker</i>)	1040
Soil Analysis: A Handbook of Physical and Chemical Methods (<i>C. M. Wright</i>)	718
Soil Management for Greenkeepers (<i>M. H. Cubbon</i> and <i>M. J. Markuson</i>)	416
Soil Science (<i>A. de Sigmond</i>)	609
Special Manures for Garden Plants (<i>A. J. Macself</i>)	1255
Spray Calendar	418
Studies in Tropical Land Tenure (<i>H. M. Leake</i>)	97
Summary of Food Laws and Regulations (<i>C. L. Hinton</i>)	817 1038
Termites and Termite Control (ed. <i>C. A. Kofoid</i>)	518
Tithes and Variable Rentcharges (<i>P. W. Millard</i>)	100
Traité d'Economie Rurale: I—La Terre (<i>A. Delos</i>)	98
Treatise on Rural Economy: 1—The Land (<i>A. Delos</i>)	98

Book Notices: (continued)	PAGE
Untersuchungen über das Kalkbedürfnis der Böden Durch Laboratoriumsmethoden und Düngungsversuche (ed. O. <i>Lemmernann</i> and <i>L. Fresenius</i>)	414
Veterinary Hygiene (<i>R. G. Linton</i>)	819
Virus Diseases of Plants (<i>J. Grainger</i>)	1137
Watermills and Windmills: An Historical Survey (<i>W. Coles Finch</i>)	216
Weed Suppression by Fertilizers and Chemicals (<i>H. C. Long</i>)	819
Weekly Weather Report, Vols. XLIX and L	516, 1256
Wheat in Great Britain (<i>J. Percival</i>)	516
Woollen and Worsted Raw Materials (<i>J. R. Hind</i>)	718
World Agriculture and the Depression (<i>V. O. Timoshenko</i>) ..	713
World Wheat Problem (<i>P. de Hevesy</i>)	716
Wright's Encyclopædia of Gardening (<i>P. Wright</i>)	413
Yearbook of Agricultural Co-operation	517
Young Man in Farming (<i>A. K. Getman</i> and <i>P. W. Chapman</i>)	515
Your Meals and Your Money (<i>G. Hambridge</i>)	1254
Breeding Poultry for Egg Production	658
British Farming, Impressions of	13, 118, 248, 464
Broccoli Industry, The	1063
Bulletins, see <i>Publications, Official</i> .	
Cahn Hill-Improvement Scheme	542
Caldwell, J: Control of Virus Diseases of the Tomato	743
Canada: see <i>Acts of Parliament and Marketing</i> .	
Canning, see <i>Marketing</i> .	
Cattle, see <i>Live Stock</i> .	
Cereals, see also <i>Acts of Parliament, Farm Notes, Feeding, Manur- ing and Marketing</i> .	
Maize	942
Oats, Resistance Seed	431
Spring-sown Oats in Wales	1182
Synonyms	1149
Varieties for Spring Sowing	1044
Wheatfeed, Fibre Content of British-milled	255
Wheat, New Zealand Prize-winning	6
Wheat, Sampling Observations on	218, 533, 662, 1152
Chreal, W. F: Apple Scab Spraying Experiments	1190
Cherries, see <i>Fruit</i> .	
Cider: Fruit Crop Estimate (1934)	706
Orcharding in Herefordshire	965
Colleges and Research Stations, see also <i>Conferences, Education, Notes and Reports</i> .	
National Poultry Institute Scheme	510
Official Seed Testing Station	86
Rothamsted and Woburn, Summer Visits to	309
Rothamsted Experimental Station, Appeal Fund	7
Colorado Beetle at Tilbury—II	1058
Commercial Apple-Spraying Demonstration in 1933	733
Commissions, Committees and Councils, see also <i>Council of Agri- culture</i> .	
Agricultural Machinery Testing Committee	533, 832, 1047, 1158
British Sugar Industry: Committee of Inquiry	182
Cattle Committee	538
Consumers' Committee on Retail Prices of Milk	1
Marketing Committee of Investigation for England	182
Reorganization Commission for Eggs and Poultry	894
Reorganization Commission for Fat Stock for England and Wales	113
Competitions, Examinations, etc., see also <i>Marketing</i> .	
Farm Institute Live Stock Judging Competition	406
Fream Memorial Prize	310
Jones-Bateman Cup for Research in Fruit-Growing	510
National Diploma in Agriculture	310
Young Farmers' Clubs Stock Judging Competitions	430, 830

	PAGE
Conferences: Brood Diseases of Bees: Rothamsted	829
Cultivation of Light Land: Rothamsted	105
Malting Barley: Rothamsted	721
Potato-Growing	4
Poultry: Midland College	603
Control of Club Root (Finger-and-Toe) in Cauliflowers	329
Control of Flea Beetles in Seed-Beds	1070, 1154
Control of Flea Beetles with a Naphthalene-Silica Dust	1079
Control of Mites in Cheese Stores	347
Control of the Cabbage Root Fly	154
Control of the Common Green Capsid Bug	1195
Cornea, V., and K. A. H. Murray: Study of Agricultural Prices in Germany	168
Correspondence Courses as an Aid to Agricultural Education	341
Council of Agriculture for England: 42nd and 43rd Meetings	370, 992
Bacon Indemnity Loan	376
Barley Growers, Protection for	1001
Cattle Industry (Emergency Provisions) Act	1002
Cattle Subsidy	992
Contagious Abortion	375
County Veterinary Services	379
Fat Stock Trade	376, 381
Flour Imports, Restriction of	1001
Home-killed Meat for the Forces	378
Increased Vegetable Production	378, 385
Meat Imports	999
Milk Situation	993
Milk, Supply and Demand	1004
Minister's Address	370, 996
Potato Root Eelworm	1001
Poultry Industry	1002
Sheep Scab	376
Unemployment Insurance	995, 1007
Warble Fly	375
Cranfield, H. T., A. Roebuck, and J. G. W. Stafford: Control of Mites in Cheese Stores	347
Dairy Herd Management, A Study of.. ..	557
Dairying, see also <i>Council of Agriculture, Diseases, Publications and Feeding</i> .	
Dairy Herd Management	557
Instruction in Clean Milk Production in 1933	47
Milk Consumption in Cardiff	828
Milk-fed Calves Derangement of Digestive Processes in	938
Milk Recording of Goats	509
Milk, Report of Consumers' Committee on Retail Prices	1
Milk Yields of Goats in 1934	1126
Mites in Cheese Stores	347
Daniel, C., & W. H. Long: Value of Farm Produce consumed in the Farmhouse	29
Dawe, C. V.: Study of Dairy Herd Management	557
Demonstrations and Displays, see also <i>Marketing</i> .	
Farm Crop Variety Trials (N.I.A.B.)	311
Denmark, see <i>Marketing</i> .	
Development of Scab in Stored Apples	551
Diseases and Pests of Animals: Bovine Tuberculosis, Eradication of	111
Brood Diseases of Bees	829, 1034
Foul Brood of Bees.. ..	89
Fowl Pox and Fowl Typhoid Vaccines	110
Liver Rot and Drought	530
Mastitis in Dairy Cows	945
Report (1933) of Proceedings under the Diseases of Animals Acts	527
Sheep Scab	376
Tuberculosis (Attested Herds) Scheme	1041
Warble Fly	375

Diseases and Pests of Plants, see also <i>Spraying</i> .	PAGE
Apple Capsid	878
Apple Scab	551, 733, 1190
Beet Eelworm	825
Beet Sickness	825
Black Currant Mite	880
Bulb Diseases	879
Cabbage Root Fly	154
Cherry Fruit Fly	877
Club Root (Finger-and-Toe) in Cauliflowers	329
Colorado Beetle	110, 427, 863, 1058
Common Green Capsid Bug	1195
Flea Beetles	1070, 1079, 1154
Loganberry Cane Maggot	151
Marsh Spot in Pea Seeds	833
Mosaic Disease of Sugar-beet and Related Plants	269
Onion Smut	879
Potato Diseases	125, 881
Potato Root Eelworm	1101
Scab in Stored Apples	551
Silver Leaf	878
Snapdragon (<i>Antirrhinum</i>) Rust	336
Virus Diseases of the Tomato	743
Wart Disease Immunity Trials	1030
Drainage and Reclamation: Land Improvement by Warping	436
St. Germans, New Sluice and Pumping Station at	729
Education and Research, see also <i>Colleges, Reports and Scholarships</i> .	
Clean Milk Production, Instruction in	47
Correspondence Courses as an Aid to Agricultural Education	341
Horticulture, Revision Course at Reading University	11
Lectures on Soils	816
Maynard Ganga Ram Prize	944
Midland College Farm Engineering Course	320
National Diploma in Agriculture (1935)	1130
National Diploma in Dairying (1934)	815
Paget Memorial Prize	930
Pig Management, Course of Instruction in	206
Rothamsted Experimental Station	7, 315
Rothamsted Winter Lectures	707
Edwards, E. E: Control of the Cabbage Root Fly	154
Eggs, see <i>Marketing and Poultry</i> .	
Ensilage, Modern Developments of	566
Exhibitions and Shows, see also <i>Marketing</i> .	
Bakers' and Confectioners' Exhibition (1934)	788
British Industries Fair	1098
Imperial Fruit Show (1934)	12, 854
South London Exhibition	1099
Western Commercial Show, Penzance (1934)	209
Women's Institute Exhibits	425, 529
Export of Breeding Stock	307, 813
Farm Notes (Monthly)	68, 191, 289, 390, 494, 587, 687, 793, 911, 1008, 1107, 1223
Age Factor in Farming	1011
Arable Cultivation	195
Arable Operations	393, 588
Bacon Pig	192
Barley	1225
Black Leg	796
Conclusion of Farming Year	1226
Corn Harvest	495
Elimination of Waste	912
Equipment, Choice of Farming	1012
Essential Equipment	796

Farm Notes (Monthly): (*continued*)

	PAGE
Farming against Drought	688
Grass Land	194
Horse-breeding	69
Internal Equipment of Cowsheds	496
Lambing Pen	1009
Live Stock	294, 394, 794, 1111
Liquid Manure	391
Mild Winter, The	1107
Piggery Construction and Alterations	590
Pig-grading Results	1223
Pregnancy Test for Mares	914
Proven Bull	499
Root Breaks	72, 291
Singling	292
Spring Oat Crop	1108
Stubble Cleaning	496
Summer Shows	289
Wheat, Change of Seed in	589
Wheat Production	690

Farm Values of Feeding Stuffs (Monthly)	83, 205, 301, 402, 507, 598, 704, 805, 927, 1029, 1124, 1239
---	--

Feathers, see *Poultry*.

Feeding, (Monthly) Notes on	81, 201, 296, 397, 502, 594, 700, 804, 922, 1021, 1118, 1234
-----------------------------	--

Adulteration	1234
Amateur turned Professional	700
American Agriculture	804
Anæmia in Farm Animals, Feeding in Relation to	296
Artificial Drying of Young Grass	1049
Autumn and Winter Grass	922
Autumn Feeding of Cows	701
Costs of Home-produced and Purchased Foods	1022
Crop Production	597
Disposal of Home-produced Foods	595
Dried Grass <i>versus</i> Lucerne Meal	1055
Early Spring Grass	924
Effect of Feeding on "Cripples" in Lambs	81
Ensilage Method	399
Experimental Methods	1119
Fat in Milk	1122
Feeding Cattle	1120
Feeding Stock	503, 1237
Fish Meal in Pig Rations	201
Grading of Bacon Pigs	81
Growth-rate and Grading	505
Haymaking, Loss of Food Value in	398
Heated Hay	1122
Individual Variation	1118
Intensity of Stocking	1025
Lucerne, Composition and Feeding Value of	137
Milk, Separated	202
Pasturage	502
Pig Contracts	805
Pig-grading Problems	504
Poisonous Herbs	1235
Potatoes in Pig Feeding	562
Poultry Feeding	701
Purchasing Foodstuffs	1234
Rations for Baconers	504
Summer Grasses, A Supplement for	299
Synthetic Hormone, A	925
Valuation of Purchased Foods	594
Value of Grass	397, 398
Vitamin E	298

Feeding, (Monthly) Notes on: (continued)	PAGE
Wheat <i>versus</i> Oats for Poultry	83, 298
Whey	203
Feeding Stuffs, Prices of (Monthly Tables)	82, 204, 300, 401, 508, 599, 705, 809, 926, 1028, 1123, 1238
Fertilizers, see <i>Manuring</i>.	
Fibre Content of British-milled Wheatfeed	253
First English Book on Clover	353
Fisher, E. A., & T. Shaw: Fibre Content of British-milled Wheat- feed	255
Flea Beetles, Control with a Naphthalene-Silica Dust	1079
Flea Beetles in Seed-Beds, Control of	1070, 1154
Francis, P. A.: Breeding Poultry for Egg Production	658
Table Poultry Industry	34
Fruit, see also <i>Cider, Exhibitions, Marketing and Spraying</i>.	
Black Currants, Certified Stocks of	306
Cherries, Importation of	305
Strawberries, Certified Stocks of	306
Fryer, J. C. F: Colorado Beetle at Tilbury—II	1058
Fussell, G. E: First English Book on Clover	353
 Gardner, H. W., J. Hunter Smith, and C. E. Hudson: (Monthly) Notes on Manuring	74, 197
Garrad, G. H., and J. N. Sharrock: Correspondence Courses as an Aid to Agricultural Education	341
German Fat Monopoly	240
Glasshouses, Alternative Systems of Heating	632
Goats: British Goat Society's Yearbook	417
Milk Recording	509
Milk Yields in 1934	1126
Stud Premium Scheme	706
 Hanley, F: Experiments on the Value of Decorticated Sugar-beet Seed	21
Hanley, F., and F. Rayns: (Monthly) Notes on Manuring	1014
Hodges, H: Utilization of Poultry Feathers	750
Honey, see <i>Apiculture</i> .	
Hop Returns	932
Hudson, C. E., J. Hunter Smith and H. W. Gardner: (Monthly) Notes on Manuring	74, 197
 Impressions of British Farming	13, 118, 248, 464
Index Number, see <i>Agricultural Returns and Statistics</i> .	
Insecticides and Fungicides, Specifications for Certain	225
Insect Pests, see <i>Diseases and Pests of Animals and Plants</i> .	
Intensive Treatment of a Wiltshire Down Pasture	470
Irish Free State, see <i>Acts of Parliament and Marketing</i> .	
 Jarv, S. G., M. D. Austin and H. Martin. Control of the Common Green Capsid Bug	1195
Jones, E. T: Spring-sown Oats in Wales	1182
 Kent, W. G: A Commercial Apple-Spraying Demonstration in 1933	733
 Land Drainage, see <i>Drainage</i> .	
Land: Allotments	1047
Extinguishment of Manorial Incidents	1154
Improvement by Warping	436
Settlement Association	1043
Library of the Ministry: Additions, etc	101, 421, 611, 1140
Live Stock, see also <i>Diseases and Pests of Animals, Feeding, Goats, Poultry, Publications and Reports</i>.	
Bulls: Licensing under Improvement of Live Stock Act (1931)	2, 405

Live Stock, etc.: (<i>continued</i>)	PAGE
Cattle Industry, Emergency Provisions for Assisting	535
Cattle, Show Standards of.. ..	623
Export of Breeding Stock	307, 813
Farm Institute Judging Competition	406
Live Stock Situation: Deputation to the Minister	217
Reorganization of the Live Stock Industry	113
Sheep Dips Damage to Wool from Colouring Matter in	944
Sheep, Tar-making of	725
Stallions: Licensing under Horse Breeding Act (1918)	774
Loganberry Cane Maggot	151
Long, W. H., & C. Daniel: Value of Farm Produce consumed in the Farmhouse	29
Machinery: Agricultural Machinery Testing Committee 533, 832, 1047, 1158	
Beet-lifting Machinery Demonstration	727
Power Farming Course	1046
Sparsholt Demonstration of Implements and Machinery	428
Mangold Crop in New Zealand, A Record	522
Manures, Prices of Artificial (Monthly Tables) 80, 196, 295, 396, 501, 593, 699, 803, 921, 1020, 1117, 1233	
Manuring, (Monthly) Notes on 74, 197, 693, 798, 916, 1014, 1112, 1228	
Artificial Manures	1112
Art of Manuring	78
Autumn-sown Two-rowed Barleys	695
Beet Tops as a Green Manure	801
Brussels Sprouts	1014
"Condition" on Power Farms	798
Crop Failure	919
Effect of Rainfall on Response to Nitrogen	74
Farm Manurings	1042
Fertilizers with the Seed	1230
Importance of Supplies of Organic Matter	77
Lodging in Cereals	1114
Malting Barley	1016
Nitrogen, Autumn Applications of	697
Organic Manures	76
Policy of Manuring	694
Potato Manuring	1112
Potato Mixtures	1113
Poultry Feathers	754
Poultry Manure	916
Practical Example	1231
Root Crops	197
Seaweed as Manure	107
Sheep Folding	918
Sugar-beet	1228
Top Dressings for Cereals	74
Marketing and the National Mark, see also <i>Council of Agriculture, Publications (Official), Notes and Reports</i> 53, 178, 275, 359, 476, 570, 667, 777, 892, 975, 1084, 1206	
Apples	901
Australia: Butter and Cheese Marketing.. ..	492
Bacon 57, 178, 185, 276, 361, 476, 572, 671, 779, 893, 976, 1086, 1206	
Bacon (Import Regulation) Order (1934)	184
Bacon Imports	1089, 1217
Bacon Supplies in 1934	1088
Beef	186, 488, 784, 1097
Beet-sugar Industry	573, 790
Beet Sugar, Production of Home-grown	1095, 1216
British Industries Fair	1098
Canada: Bacon Grading Regulations	288
Canada: Marketing Schemes	1099
Canada: Natural Products Marketing Act	284, 685
Cattle and Poultry Show, Birmingham	788
Cattle Committee	981

Marketing Notes: (continued)	PAGE
Cattle Fund	900, 1092
Cattle (Import Regulation) Order, 1933	1090
Cattle Industry (Emergency Provisions) Act (1934)	678, 784
Cheese, Cheddar	364
Cheese, Cheshire	187, 364, 904, 1098
Cheese, Investigations into the Blue Veining of	187
Cheesemakers. Farm	484
Cheese—Milk Price	980
Cheese, Stilton	902, 1098
Committee of Investigation for England	182, 673, 894
Competition for New Designs for National Mark Labels	682
Consumers' Committee for England	674
Cucumbers	981
Demonstrations 64, 188, 281, 365, 489, 578, 681, 790, 906	
Displays	65, 1221
Eggs 53, 66, 278, 487, 575, 788, 900, 1218	
Fat Stock—Sales by Grade and Dead Weight	680, 902, 1095
Fat Stock Direct Consignment Schemes	62, 280, 574
Fat Stock Shows	983
Flour at Bakers' and Confectioners' Exhibition (1934), National Mark	788
Flour Cookery Competition	189
Flowers and Plants Publicity Committee	682, 791
Flowers for the King's Silver Jubilee	1221
Fruit, National Mark Canned	786
Fruit, National Mark Fresh	576, 901
Germany: Animal and Animal Products Act	989
Germany: Association of Rye and Wheat Mills	368
Germany: Organized Egg-Marketing	66
Germany: Regulation of Potato Marketing	367, 909
Grapes, Hothouse, Proposed National Mark Scheme	575
Guernsey: Marketing Reorganization	283
Honey	784
Hops 179, 478, 673, 782, 894	
Importance of Attractive Labels	850
Imports of Agricultural Products, Regulation of	675
Irish Free State: Agricultural Produce (Cereals) Act (1934)	907
Irish Free State: Registration of Shops	906
Irish Free State: Slaughter of Cattle and Sheep Act (1934)	684
Kent: National Mark Campaign	983, 1221
Labels and Label Designs, Exhibition of	790, 850
Manx Marketing Act	791
Meat Imports (Jan.-Mar., 1935), Regulation of	1092
Milk 180, 275, 359, 481, 484, 571, 667, 777, 892, 975	
Milk Act (1934) 570, 679, 783, 898, 979, 1093, 1084, 1206, 1213	
Milk for Schools	978
Milks, Processed	482, 1215
Milk Publicity, Advisory Committee on	570
Milk Reorganization Commission for Great Britain	1208
National Mark: A Rural Survey	190
New Zealand: Agriculture (Emergency Powers) Bill	986
New Zealand: Report of Dairy Industry Commission	984
Northern Ireland: Control of Sales of Bacon Pigs by Pigs Marketing Boards	683
Northern Ireland: Marketing of Potatoes Act (1934)	491
Oats	1216
Pigs 57, 178, 276, 361, 476, 572, 671, 779, 893, 976, 1086, 1206	
Perry	901
Plants and Flowers, Publicity for Home-grown	65
Plums, Home-grown	787
Potatoes 54, 179, 185, 362, 486, 572, 672, 782, 897, 976, 1085, 1208	
Potatoes, Regulation of Imports	362
Poultry (Dressed)	280, 680, 1220
Poultry Industry, Reorganization of	1209
Public Authorities, Use of National Mark Products by	282

Marketing Notes: (continued)

	PAGE
Publicity	65, 189, 365
Publicity for Home-grown Flowers and Plants	190, 282, 366
Recipe Book, National Mark	682
Regulation of Meat Imports (Jan.-Mar., 1935)	1092
Regulation of Potato Supplies	894
Regulation of Supplies	182
Rhubarb	981
Reorganization Commission for Eggs and Poultry	894
Reorganization Commission for Fat Stock	113
Shopping Campaigns, National Mark	681
South Australia: Fruit and Vegetable (Grading) Act (1934) ..	1222
South London Exhibition	1099
Strawberries, Home-grown	576
Sugar-beet	277, 486, 899, 978
Sugar, Home-produced	58, 899
Sugar Industry, Committee of Inquiry on	182
Sugar Subsidy Act (1934)	486
Tomatoes	981
Tomatoes, Quality of English	901
Turkeys, Improved Marketing (Christmas, 1934)	785
Union of South Africa: Live Stock and Meat Industries Act (1934)	988
United States of America: Standards of Quality for Canned Goods	493
Vegetables	63, 279, 489, 786, 982
Vegetables, Canned	982
Vegetables, Fresh	982
Wheat	62, 181
Wheat Act (1932)	574, 667, 789, 897, 980, 1094
Wheat Flour for Breadmaking, Suitability of National Mark	905
Women's Institute stall, Embkton	425
Young Grocers' Tour	366
Management and Mechanization in Farming	1159
Marsh Spot in Pea Seeds	833
Martin, H., M. D. Austin and S. G. Jary. Control of the Common Capsid Bug	1195
Mastitis in Dairy Cows and Its Control	945
Meat, see also <i>Marketing</i> and <i>Poultry</i> .	
Mercer, W. B., and Colleagues: (Monthly) Notes on Feeding ..	397, 502, 594, 700, 804, 922, 1021, 1118, 1234
Meteorology. Drought	313, 603
Farm Water Supplies and Manurings	1042
Mild Winter	1107
Sampling Observations on Wheat	218, 533, 662, 1152
Miles, H. W. Control of Flea Beetles with a Naphthalene-Silica Dust	1079
Milk, see <i>Acts of Parliament, Dairying and Marketing</i> .	
Mosaic Disease of Sugar-beet and Related Plants	269
Murray, K. A. H., and V. Cornea: Study of Agricultural Prices in Germany	168
National Mark, see <i>Marketing</i> .	
Nevile, G. H.: Management and Mechanization in Farming	1159
New Sluice and Pumping Station at St. Germans	729
New Type of Spray for Fruit Trees	433
Notes for the Month and Miscellaneous Notes, see also <i>Farm Notes, Feeding, Manuring and Marketing</i> .	
Advisory Leaflets	12, 513, 810, 1127
Agricultural Index Number 87, 206, 302, 403, 511, 600, 708, 810, 928, 1031, 1128, 1244	726
Agricultural Literature	726
Agricultural Machinery Testing Committee	533, 832, 1047, 1158
Agricultural Output of England and Wales (1930-31)	409
Agricultural Produce Index Number (1934)	1240

Notes for the Month, etc: (<i>continued</i>)	PAGE
Agricultural Research	314, 824
Agricultural Research Scholarships and Studentships	11, 711
Agricultural Returns of England and Wales (1934)	539, 932, 1102
Agricultural Scholarships	8
Agricultural Statistics: Appeal to Occupiers of Agricultural Land	109
Agricultural Statistics (Parts I and II), 1933	531
Agricultural Wages (Regulation) Act (1924): Report of Proceedings	622
Allotments	1047
Apple Packing	724
Basis for Redemption of Tithe Rentcharge	87, 112, 619, 1048
Beet-lifting Machinery Demonstration in Norfolk	727
Beet Sickness in England (<i>F. R. Petherbridge</i>)	825
Breeding Stock, Export of	307, 813
Britain's Food Imports	1157
Brood Diseases of Bees	829
Cattle and Beef Survey	521
Cattle Fund	1212
Cereal Synonyms	1149
Cherries, Importation of	305
Chickens in Carbon Dioxide, Storage of (<i>E. C. Smith</i>)	618
Cider Fruit Crop Estimate (1934)	706
Colorado Beetle	110, 427
Damage to Wool from Colouring Matter in Sheep Dips	944
Derangement of Digestive Processes in Milk-fed Calves	938
Destruction of Weeds	1048
Diseases of Animals in 1933	527
Drought, Fodder Crops in Time of	313
Drought, Effect on "Stomach-Worm Disease" or "Scouring" in Lambs	603
Eradication of Annual Weeds in Bulb Crops (<i>G. H. Bates</i>)	1145
Eradication of Bovine Tuberculosis (<i>L. Jordan</i>)	111
Extinguishment of Manorial Incidents	1154
Factory-Abattoir Design	524
Farm and Machine	318
Farm Crop Variety Trials (N.I.A.B.)	311
Farm Institute Live Stock Judging Competition	406
Farm Water Supplies and Manurings	1042
Fees for Seed Testing	426
Food Investigation	727
Food of the Stock Dove	723
Foul Brood of Bees	89
Fowl Pox and Fowl Typhoid Vaccines	110
French Chambers of Agriculture	84
Fruit Supplies in 1933	532
Garlic in Wheat	1157
Horsham Young Farmers' Club	11
Imperial Fruit Show (1934)	12
Implement and Machinery Demonstration at Sparsholt	428
Inspection and Certification of Wild White Clover	9
International Poultry Exhibition, Paris (1935)	1131
International Yearbook of Agricultural Statistics	308
Investigations on Tuberculous Infection in Milk	10
Jones-Bateman Cup for Research in Fruit-Growing	510
Land Improvement Loans	408
Land Settlement Association	1043
Lectures on Soils	816
Library of the International Institute of Agriculture	710
Licensing of Bulls in England and Wales	2, 405
Liver Rot and the Drought	530
Live-stock Situation: Deputation to the Minister	217
Maize	942
Management in Agriculture	620

Notes for the Month, etc.: (continued)

	PAGE
Mangold Crop in New Zealand, a Record (<i>Lord Bledisloe</i>) ..	522
Malting Barley Conference at Rothamsted	721
Marketing Co-operation, Need for (<i>Lord De La Warr</i>) ..	937
Marketing Schemes and Public Health	617
Marking of Imported Meat	426
Maynard Ganga Ram Prize	944
Midland College Farm Engineering Course	320
Midland College Poultry Conference	603
Milk Consumption in Cardiff (<i>W. H. Jones and W. J. Cowie</i>) ..	828
Milk Recording of Goats	509
Milk Yields of Goats in 1934	1126
National Diploma in Agriculture and the Fream Memorial Prize	310, 1130
National Diploma in Dairying (1934)	815
National Poultry Institute Scheme	510
National Rat Week	621
New Zealand Prize-winning Wheat	6
Official Seed Testing Station	86, 1146
Official Statistics	432
Paget Memorial Prize	930
Pig-house Ventilation	221
Pig Management, Course of Instruction in	206
Potato Acreages in Scotland (1934)	931
Potatoes, Inspection of Growing Crops of	302
Potato-Growing Conference	4
Potato Synonyms	1148
Power Farming Course at Harper Adams Agricultural College (<i>C. Crowther</i>)	1046
Register of Dairy Cattle	304
Register of Growers of Certified Narcissus Stocks	403
Research into Brood Diseases of Bees at Rothamsted	1034
Resistance Seed Oats	431
Retail Prices of Milk: Report of Consumers' Committee ..	I
Revision Course in Horticulture at Reading University ..	11
Rothamsted Annual Report (1933)	1125
Rothamsted Conference on the Cultivation of Light Land ..	105
Rothamsted Experimental Station, Appeal Fund	7
Rothamsted Holdings	315
Rothamsted Winter Lectures	707
Sampling Observations on Wheat 218, 533, 662, 1152	
Scholarships for Sons and Daughters of Agricultural Workmen	707
Seaweed as Manure, Use of	107
Smallholdings for Unemployed Persons, New Association for ..	526
Smallholdings (Government Assistance)	224
Starling Roosts	1045
Strawberries and Black Currants, Certified Stocks of	306
Stud Goat Scheme	706
Summer Demonstrations at Rothamsted and Woburn	309
Surrey Women's Institutes and Food Production	529
Tar-marking of Sheep, Warning against	725
Timber Research, Progress in	726
Tithe Rentcharge, Basis for Redemption of 87, 112, 619, 1048	
Tuberculosis (Attested Herds) Scheme for England and Wales ..	1041
United Dairies' Scholarships (1934-5)	600
Varieties of Cereals for Spring Sowing	1044
Ventilation of Pig-houses	221
Village Halls, Provision of	407
Wart Disease Immunity Trials	1030
Weed Control of Asparagus (<i>J. C. Wallace</i>)	940
Weeds, Destruction of Injurious 223, 1048, 1145	
Western Commercial Show, Penzance (1934)	209
Wheat, Sampling Observations on 218, 533, 662, 1152	
Wild White Clover Certification Scheme	1147
Wireless Talks to Farmers 606, 713, 816, 1131, 1251	

Notes for the Month, etc.: (<i>continued</i>)	PAGE
Women's Institute Stall, A Successful	425
Young Farmers' Clubs: Annual Cattle and Poultry Judging Competitions	830
Young Farmers' Clubs: International Dairy Cattle Judging Competition	430
Oats, see <i>Cereals</i>	
Observations on Potato Sick Soils in Devon and Cornwall ..	1187
Oldham, C. H.: The Broccoli Industry	1063
Palatability and the Management of the Poorer Grass Lands ..	321
Pasture: Artificial Drying of Young Grass	1049
Birdsfoot Trefoil	162
Cahn Hill-Improvement Scheme	542
Clover, First English Book on	353
Intensive Treatment of Wiltshire Down	470
Palatability and Management of Poorer Grass Lands	321
Wild White Clover, Inspection and Certification of	9, 1147
Pests: see also <i>Diseases and Pests</i> . National Rat Week (1934) ..	621
Petherbridge, F. R., and I. Thomas: Control of Flea Beetles in Seed Beds	1070
Pethybridge, G. H.: Marsh Spot in Pea Seeds	833
Potato Diseases	125
Snapdragon (<i>Antirrhinum</i>) Rust	336
Pigs, see also <i>Feeding and Marketing</i> . Piggeries at the Agricultural Research Institute for Northern Ireland	229
Ventilation of Pig-houses	221
Potatoes, see also <i>Diseases of Plants, Marketing</i> . Acreages in Scotland (1934)	931
Chilled Seed Potatoes, Yield Results from	956
Inspection of Growing Crops	302
Observations on Potato-Sick Soils in Devon and Cornwall ..	1187
Pig Feeding, Potatoes in	562
Synonyms	1148
Poultry, see also <i>Marketing</i> . Breeding for Egg Production	658
Feathers, Utilization of	750
Fowl Pox and Fowl Typhoid Vaccines	110
Storage of Chickens in Carbon Dioxide	618
Table Poultry Industry	34
Preston, N. C.: Control of Club Root (Finger-and-Toe) in Cauli-flowers	329
Prices of Artificial Manures, see <i>Manures</i> . Prices of Feeding Stuffs, see <i>Feeding Stuffs</i> . Problems of Farm Management in Wheat Production	1168
Publications, see <i>Book Notices, Library and Reports</i> . Publications, Official, see also <i>Reports</i> . Advisory Leaflets	12, 110, 513, 810
Apple Packing (Bulletin No. 84)	724
Cattle and Beef Survey	521
Fruit Supplies in 1933	532
Guide to Official Statistics, Vol. XII	432
Poisonous Plants on the Farm (Bulletin No. 75)	1235
Register of Dairy Cattle, Vol. XVII	304
Selected and Classified List of Books on Agriculture (Bulletin No. 78)	726
Statutory Rules and Orders (1934)	184
Weeds of Arable Land (Bulletin No. 61)	1157
Rae, R.: Piggeries at the Agricultural Research Institute for Northern Ireland	229
Rats, see <i>Pests</i> . Rayns, F., and G. H. Bates: (Monthly) Notes on Manuring ..	1112
Rayns, F., and F. Hanley: (Monthly) Notes on Manuring ..	1014

	PAGE
Rayns, F., and E. T. Sykes: (Monthly) Notes on Manuring ..	693,
	798, 916, 1228
Reports: Abattoir Design: Report of the Technical Committee ..	534
Agricultural Machinery Testing Committee ..	533, 832, 1047, 1158
Agricultural Machinery Testing Committee ..	533, 1047
Agricultural Research Council ..	828
Agricultural Statistics, Parts I and II (1933) ..	531
Diseases of Animals (1933) ..	527
Education and Research Division (1932-3) ..	640, 755, 863
Eradication of Bovine Tuberculosis (<i>L. Jordan</i>) ..	111
Food Investigation Board (1933) ..	727
Forest Products Research Board (1933) ..	726
Institute for Research in Agricultural Machinery ..	318
Live Stock Improvement Scheme ..	443
Maize: 28th Report of the Imperial Economic Committee ..	942
Reorganization Commission for Fat Stock for England and Wales ..	113
Reorganization Commission for Eggs and Poultry for England and Wales ..	1209
Sampling Observations on Wheat ..	218, 533, 662, 1152
Seed Testing Station, Official ..	86, 1146
Rothamsted Experimental Station (1933) ..	1125
Tuberculous Infection of Milk ..	10
Research, see <i>Education</i> .	
Robinson, D. H: Birdsfoot Trefoil ..	162
Robinson, H. G: (Monthly) Farm Notes ..	68, 191, 289, 390, 494, 587, 687,
	793, 911, 1008, 1107, 1223
Roebuck, A., H. T. Cranfield, and J. G. W. Stafford: Control of Mites in Cheese Stores ..	347
Roots: Mangold Crop in New Zealand, A Record ..	522
Ruston, A. G: Land Improvement by Warping ..	436
Sampling Observations on Wheat ..	218, 533, 662, 1152
Savidge, C: Cider Orchard in Herefordshire ..	965
Scholarships: Agricultural ..	8, 11, 707, 711
Studentships ..	11, 711
Travelling ..	832
United Dairies' (1934-35) ..	600
Seeds and Seed Testing, see also <i>Acts of Parliament</i> and <i>Reports</i> .	
Fees for Seed Testing ..	426
Seed Testing ..	1178
Seed-Testing Station Report ..	86, 1146
Sharrock, J. N., and G. H. Garrad: Correspondence Courses as an Aid to Agricultural Education ..	341
Shaw, T., and E. A. Fisher: Fibre Content of British-Milled Wheatfeed ..	255
Sheep, see <i>Livestock</i> .	
Show Standards of Cattle ..	623
Smallholdings: Association for Smallholdings for Unemployed Persons ..	526
Government Assistance ..	224
Smith, A. D. Buchanan: Show Standards of Cattle ..	623
Smith, J. Hunter, C. E. Hudson and H. W. Gardner: Notes on Manuring (Monthly) ..	74, 197
Smith, K. M: Mosaic Disease of Sugar-beet and Related Plants ..	269
Snapdragon (<i>Antirrhinum</i>) Rust ..	336
Spraying: Apple Scab Spraying Experiments ..	1190
Commercial Apple-Spraying Demonstration (1933) ..	733
New Type of Spray for Fruit Trees ..	433
Spring-sown Oats in Wales ..	1182
Stableforth, A. W: Mastitis in Dairy Cows and Its Control ..	945
Stafford, J. G. W., H. T. Cranfield, and A. Roebuck: Control of Mites in Cheese Stores ..	347
Staniland, L. N: Loganberry Cane Maggot ..	151

	PAGE
Stapledon, R. G: Palatability and the Management of the Poorer	
Grass Lands	321
Cahn Hill-Improvement Scheme	542
Statistics, see <i>Agricultural Returns and Statistics and Notes.</i>	
Stewart, W. A: (Monthly) Notes on Feeding	81, 201, 296
Strawberries, see <i>Fruit.</i>	
Study of Agricultural Prices in Germany	168
Sugar-beet and Beet Sugar: Experiments on the Value of Decorticated Sugar-beet Seed	21
Beet-lifting Machinery Demonstration	727
Mosaic Disease of Sugar-beet	269
Sykes, E. T., and F. Rayns: (Monthly) Notes on Manuring 693, 798, 916, 1228	
Taylor, H. V: Alternative Systems of Heating Glasshouses ..	632
Thomas, I., and F. R. Petherbridge: Control of Flea Beetles in Seed-Beds	1070
Thompson, J. K., and J. C. Wallace: Potatoes in Pig Breeding ..	562
Tithe Rentcharge	87, 112, 619, 1048
Turnbull, J: New Type of Spray for Fruit Trees	433
Value of Farm Produce consumed in the Farm-House	29
Vegetables, see <i>Broccoli, Marketing, Notes and Potatoes.</i>	
Virus Diseases of the Tomato, Control of	743
Wages: Enforcement of Minimum Rates 93, 215, 312, 411, 514, 606, 712, 815, 935, 1036, 1132, 1251	
Farm Workers' Minimum 90, 213, 311, 410, 604, 711, 814, 933, 1035, 1246	
Wallace, E. R: Yield Results from Chilled Seed Potatoes	956
Wallace, J. C., and J. K. Thompson: Potatoes in Pig Feeding ..	562
Warne, L. G. G: Intensive Treatment of a Wiltshire Down Pasture	470
Watson, J. A. Scott: Some Impressions of British Farming 13, 118, 248, 464	
Problems of Farm Management in Wheat Production	1168
Weather, see <i>Meteorology.</i>	
Weeds: Destruction of Injurious Weeds	223, 1048
Eradication of Annual Weeds in Bulb Crops	1145
Garlic in Wheat	1157
Weed Control in Asparagus	940
Wiltshire Down Pasture, Intensive Treatment of	470
Wireless Talks to Farmers	606, 713, 816, 1131, 1251
Wool, Damage from Colouring Matter in Sheep Dips	944
Woodman, H. E: Artificial Drying of Young Grass	1049
Modern Developments of Ensilage	566
Wormald, H: Development of Scab in Stored Apples	551
Yield Results from Chilled Seed Potatoes (<i>E. R. Wallace</i>) ..	956
Young Farmers' Clubs: Annual Cattle and Poultry Judging Competitions	830
Horsham Young Farmers' Club	11
International Dairy Cattle Judging Competitions	830

